



US Army Corps
of Engineers

DTIC FILE COPY

MISCELLANEOUS PAPER EL-90-23

2

ASSESSMENT OF AVIAN BOTULISM CONTROL PILOT PROJECT AT THE DIKE 14 CONFINED DREDGED MATERIAL DISPOSAL FACILITY, CLEVELAND, OHIO

AD-A231 729

by

John W. Simmers

Environmental Laboratory

DEPARTMENT OF THE ARMY

Waterways Experiment Station, Corps of Engineers
3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6199

Steven I. Apfelbaum

Applied Ecological Services, Inc.
N673 Mill Road
Juda, Wisconsin 53550

and

Len F. Bryniarski

US Army Engineer District, Buffalo
Buffalo, New York 14207-1399

DTIC
ELECTE
FEB 06 1991

*Original contains color
plates: All DTIC reproductions
will be in black and
white*



December 1990

Final Report

Approved for Public Release, Distribution Unlimited



Prepared for US Army Engineer District, Buffalo
Buffalo, New York 14207-1399

91 2 06 044

**Destroy this report when no longer needed. Do not return
it to the originator.**

**The findings in this report are not to be construed as an official
Department of the Army position unless so designated
by other authorized documents.**

**The contents of this report are not to be used for
advertising, publication, or promotional purposes.
Citation of trade names does not constitute an
official endorsement or approval of the use of
such commercial products.**

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
1a. REPORT SECURITY CLASSIFICATION Unclassified			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION, AVAILABILITY OF REPORT		
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE			Approved for public release; distribution unlimited.		
4. PERFORMING ORGANIZATION REPORT NUMBER(S) Miscellaneous Paper EL-90-23			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION USAEWES Environmental Laboratory		6b. OFFICE SYMBOL (if applicable)	7a. NAME OF MONITORING ORGANIZATION		
6c. ADDRESS (City, State, and ZIP Code) 3909 Halls Ferry Road Vicksburg, MS 39180-6199			7b. ADDRESS (City, State, and ZIP Code)		
8a. NAME OF FUNDING/SPONSORING ORGANIZATION USAED, Buffalo		8b. OFFICE SYMBOL (if applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8c. ADDRESS (City, State, and ZIP Code) Buffalo, NY 14207-1399			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO	PROJECT NO	TASK NO
			WORK UNIT ACCESSION NO		
11. TITLE (Include Security Classification) Assessment of Avian Botulism Control Pilot Project at the Dike 14 Confined Dredged Material Disposal Facility, Cleveland, Ohio					
12. PERSONAL AUTHOR(S) Simmers, John W.; Apfelbaum, Steven I.; Bryniarski, Len F.					
13a. TYPE OF REPORT Final report		13b. TIME COVERED FROM _____ TO _____		14. DATE OF REPORT (Year, Month, Day) December 1990	
				15. PAGE COUNT 89	
16. SUPPLEMENTARY NOTATION Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP			
			Avian botulism CDF management		
19. ABSTRACT (Continue on reverse if necessary and identify by block number)					
<p>The Dike 14 Confined Dredged Material Disposal Facility (CDF) at Cleveland, OH, was the site of an avian botulism outbreak in 1986. At that time the use of noise-making devices was not successful in preventing the use of the CDF by shorebirds, wading birds, and waterfowl susceptible to botulism. The Buffalo District of the US Army Corps of Engineers identified the problem as one requiring a generic solution that could be applied at other operational CDFs. In a pilot project, plant propagules were planted at the CDF prior to the disposal operations so that a vegetative cover would rapidly appear as the CDF dewatered after disposal operations. The vegetation on the dewatering dredged material was expected to make the CDF unattractive to shorebirds, wading birds, and waterfowl. The pilot project was a qualified success in the prevention of a 1987 outbreak of avian botulism. The duration of the disposal operation and the depth of the dredged material placed in the CDF limited the anticipated vegetation establishment. However, the final elevation of the dredged material relative to the level of Lake Erie allowed the site</p> <p style="text-align: right;">(Continued)</p>					
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION Unclassified		
22a. NAME OF RESPONSIBLE INDIVIDUAL			22b. TELEPHONE (Include Area Code)		22c. OFFICE SYMBOL

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE

19. ABSTRACT (Continued).

to dewater and the vegetation that emerged attracted a terrestrial avifauna. The observed botulism abatement was the result of both additional filling and vegetation establishment. The procedures used to establish vegetation were feasible, compatible with dredging and disposal schedules, and cost-effective. A unique combination of equipment was required, but all of the components were relatively available.

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE

SUMMARY

The Dike 14 Confined Dredged Material Disposal Facility (CDF) at Cleveland, OH, was the site of an avian botulism outbreak in 1986. At that time the use of noisemaking devices was not successful in preventing the use of the CDF by shorebirds, wading birds, and waterfowl susceptible to botulism.

The Buffalo District of the US Army Corps of Engineers identified the problem as one requiring a generic solution that could be applied at other operational CDFs. The following report describes a pilot project in which plant propagules were planted at the CDF prior to the disposal operations so that a vegetative cover would rapidly appear as the CDF dewatered after disposal operations. The presence of the vegetation on the dewatering dredged material was expected to make the CDF unattractive to shorebirds, wading birds, and waterfowl.

The pilot project was a qualified success in the prevention of a 1987 outbreak of avian botulism. The duration of the disposal operation and the depth of the dredged material placed in the CDF limited the anticipated vegetation establishment. The final elevation of the dredged material relative to the level of Lake Erie allowed the site to dewater and the vegetation that emerged attracted a terrestrial avifauna. The observed botulism abatement was the result of both additional filling and vegetation establishment.

The procedures used to establish vegetation were feasible, compatible with dredging and disposal schedules, and cost-effective. A unique combination of equipment was required, but all of the components were readily available.

Accession For	
NTIS CRA&I	✓ C
DTIC TAB	
Unannounced	
Justification	
By	
Distribution /	
Availability Codes	
Dist	Avail and/or Special
A-1	

DTIC
COPY
INSPECTED

PREFACE

This work was sponsored by the Buffalo District of the US Army Corps of Engineers (CENCB). The work was conducted by the Environmental Laboratory (EL), US Army Engineer Waterways Experiment Station (WES), Vicksburg, MS. The study was conducted under the direction of Dr. John Harrison, Chief of EL, and under the general supervision of Dr. C. R. Lee, Chief of the Contaminant Mobility and Regulatory Criteria Group, and Mr. Donald L. Robey, Chief of the Ecosystem Research and Simulation Division (ERSD).

The study was conducted by Dr. John W. Simmers of ERSD, Mr. Steven I. Apfelbaum of Applied Ecological Services, Juda, WI, and Mr. Len F. Bryniarski, Planning Division, CENCB. The CENCB Project Manager was Mr. Donald E. Borkowski.

Funding for the study was provided by CENCB. Technical reviewers were Drs. Douglas Gunnison and C. R. Lee, ERSD, and Dr. Gerould Wilhelm, The Morton Arboretum, Chicago, IL.

COL Dwayne G. Lee, CE, was the Commander and Director of WES at the time of the study. COL Larry B. Fulton, EN, is the present Commander and Director. Dr. Robert W. Whalin is Technical Director.

This report should be cited as follows:

Simmers, John W., Apfelbaum, Steven I., and Bryniarski, Len F. 1990. "Assessment of Avian Botulism Control Pilot Project at the Dike 14 Confined Disposal Facility, Cleveland, Ohio," Miscellaneous Paper EL-90 23, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

CONTENTS

	<u>Page</u>
SUMMARY	i
PREFACE	ii
CONVERSION FACTORS, NON-SI TO SI (METRIC)	
UNITS OF MEASUREMENT	iv
PART I: INTRODUCTION	1
Background	1
Objectives	4
Approach	4
PART II: METHODOLOGY	6
Plant Species	6
Equipment	6
Planting Schedule and Rates	7
PART III: RESULTS AND DISCUSSION	8
Planting Strategy Feasibility	8
Dredging Operations	8
Vegetation	8
Avifauna	9
PART IV: CONCLUSIONS AND RECOMMENDATIONS	11
TABLES 1-3	
PHOTOS 1-11	
APPENDIX A: US FISH AND WILDLIFE SERVICE REPORT ON THE 1986 AVIAN BOTULISM OUTBREAK AT DIKE 14	A1
APPENDIX B: DOCUMENTATION OF THE NUMBER OF BIRDS KILLED AT DIKE 14	B1
APPENDIX C: DIAGNOSTIC SERVICES CASE REPORTS, NATIONAL WILDLIFE HEALTH CENTER, US FISH AND WILDLIFE SERVICE	C1
APPENDIX D: BIRD SPECIES REPORTED FROM THE DIKE 14 CDF BEFORE AND AFTER THE PILOT REPORT	D1
APPENDIX E: SAGINAW, MI, CDF BOTULISM CONTROL MANAGEMENT PLAN ..	E1

CONVERSION FACTORS, NON-SI TO SI (METRIC) UNITS OF MEASUREMENT

Non-SI units of measurement used in this report can be converted to SI (metric) units as follows:

<u>Multiply</u>	<u>By</u>	<u>To Obtain</u>
acres	4,046.873	square metres
cubic yards	0.7645549	cubic metres
Fahrenheit degrees	5/9	Celsius degrees*
feet	0.3048	metres
horsepower (550 foot-pounds (force) per second)	745.6999	watts
inches	2.54	centimetres
square inches	6.4516	square centimetres

* To obtain Celsius (C) temperature readings from Fahrenheit (F) readings, use the following formula: $C = (5/9) (F - 32)$.

ASSESSMENT OF AVIAN BOTULISM CONTROL PILOT PROJECT AT THE DIKE 14 CONFINED DREDGED MATERIAL DISPOSAL FACILITY, CLEVELAND, OHIO

PART I: INTRODUCTION

Background

Avian botulism

1. Botulism is a bacterial disease often associated with anaerobic conditions on mud flats. Six strains of the bacterium *Clostridium botulinum* that may cause illness have been identified by Duffus (1980).*

2. Avian botulism is a common disease of waterfowl. The disease, also called limberneck or Western duck sickness, usually occurs in shorebirds or wading birds congregating on emerging mud flats during the late summer. The causative organisms are bacteria of the genus *Clostridium* that multiply and produce a toxin in the bodies of dead invertebrate animals under anoxic conditions. *Clostridium botulinum* type C is the specific strain responsible for limberneck in shallow-water-dwelling, insect-feeding, and omnivorous birds. The bacteria are naturally present in sediments and soils, as spores. Under anaerobic conditions, mesophilic temperatures, and pH levels ranging from 5.7 to 8.0, the spores "germinate" and the bacteria multiply rapidly. It would appear that the appropriate conditions for the multiplication of the bacteria are often present in the hot late summer and early fall months (July-October). During this period, decaying vegetation or vertebrate and/or invertebrate animal carcasses may occur along shorelines and in shallow water providing a source of protein for the bacterial growth. As a carcass decays, the decomposition process uses up available oxygen in the carcass, producing anaerobic conditions. Bacterial spores, possibly ingested when the animal was alive, "germinate" after the animal's death. As the bacteria multiply, they release toxin. As the outbreak progresses, the presence of the carcasses of dead birds may provide additional sources of infection for unaffected birds. Birds may feed directly on invertebrate carcasses that contain the toxin. Alternatively, the birds may feed on live maggots of flesh flies or blowflies that lay eggs on dead vertebrates. These insects apparently accumulate *C. botulinum* toxin in their bodies as they feed on the carcasses. Some infected birds may carry the disease to neighboring wetlands and mud flats. Once a bird is infected, the botulism toxin attacks the parasympathetic nervous system and usually causes death.

3. Botulism bacteria are naturally present in waterways and widely distributed in organic soils. Avian botulism occurs in mud flats and in naturally occurring or manmade wetlands. While little is known about the occurrence or extent of botulism infections in naturally occurring wetlands, the incidence of the disease and the presence of dead and dying birds within confined dredged material disposal facilities (CDFs) are often singled out for attention by resource agencies and the general public. As a result, Corps of

* Duffus, J. H. 1980. Environmental Toxicology, John Wiley and Sons, New York.

Engineers Districts are often requested to take action after the disease is established. Frequently attempts to reduce the populations of susceptible species with noisemakers or trained raptors are both ineffective and expensive.

CDF management

4. All CDFs progress through the same general stages. At first the dike is placed around an aquatic area. With filling, the enclosed aquatic area is replaced by a wetland and/or mud flat and, finally, an upland as the CDF is filled to capacity. At this point, control of the CDF is returned to the sponsor. Each of these stages requires management procedures appropriate to the habitat and the attracted wildlife. These management procedures are necessary to prevent the movement of contaminants, establishment of undesirable animal species, and wildlife diseases. CDF management must anticipate the possibility that avian botulism may occur at some time during CDF development. Should this event occur, the site must be managed to reduce or eliminate contact by populations of susceptible species.

5. In the US Great Lakes, CDFs contain dredged material contaminated with toxic metals, polychlorinated biphenyls, polyaromatic hydrocarbons, and other substances of industrial origin. Generally CDFs are located in waterways that are contaminated to some extent. There are no data that connect contaminants to avian botulism. The impacts of contaminant mobility and the potential incidence of botulism are apparently independent factors that must be considered in management of CDFs for wildlife usage.

6. The following report is a summary of a 1987 botulism control pilot project conducted at the Dike 14 CDF at Cleveland, OH, for the US Army Corps of Engineers Buffalo District (CENCB). The CDF was the site of an avian botulism outbreak in 1986 (Appendixes A-D). During the pilot project, a vegetative cover was used to eliminate open mud flat areas that attract wading birds. The recommended management procedures contained in this report are intended to be compatible with CENCB maintenance and operations procedures and are generically applicable to other Districts and locations. A botulism control management plan developed for the Saginaw Bay CDF in Saginaw, MI, is included as Appendix E.

Dike 14 CDF

7. The Dike 14 CDF is an endiked disposal facility of approximately 80 acres* projecting into Lake Erie in the Cleveland Harbor (Figure 1). The CDF is divided into east and west portions by the culvert that transfers Doan Brook through the CDF to the lake (Figure 2 and Photo 1). The CDF contains dredged material from the Cuyahoga River and the Cleveland outer harbor. Yearly maintenance dredging operations typically result in the placement of approximately 320,000 yd³ of dredged material into the site. One third of the material is dredged from the outer harbor and two thirds of the material is dredged from the heavily contaminated Cuyahoga River. The site is currently filled to between 50 and 60 percent of capacity. Doan Brook culvert physically divides the site into two cells and rests on stone rubble requiring the hydrostatic pressure to be balanced on both sides.

* A table of factors for converting non-SI units of measurement to SI (metric) units is presented on page iv.

Figure 1. Location of the Dike 14 CDF in the Cleveland, OH, metropolitan area.

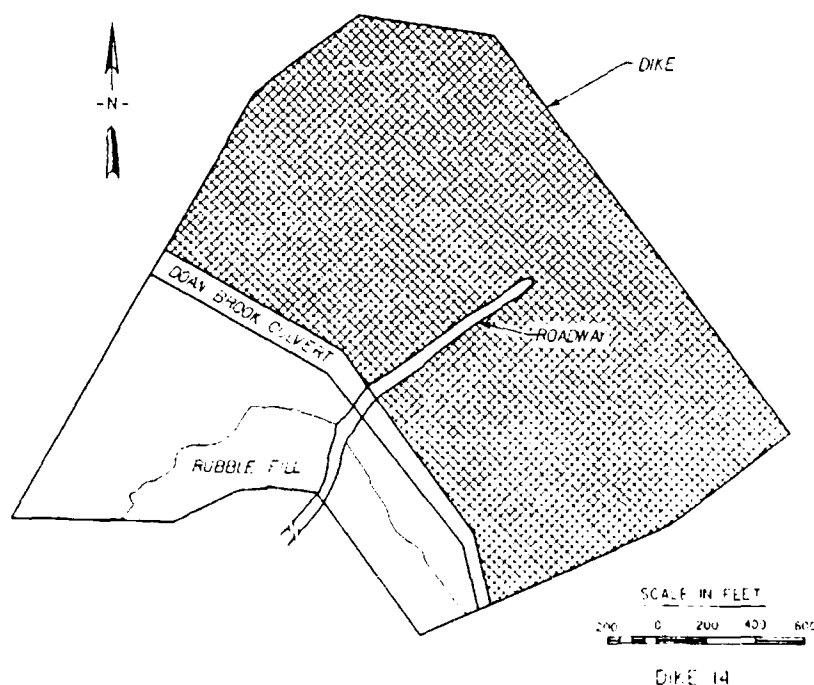
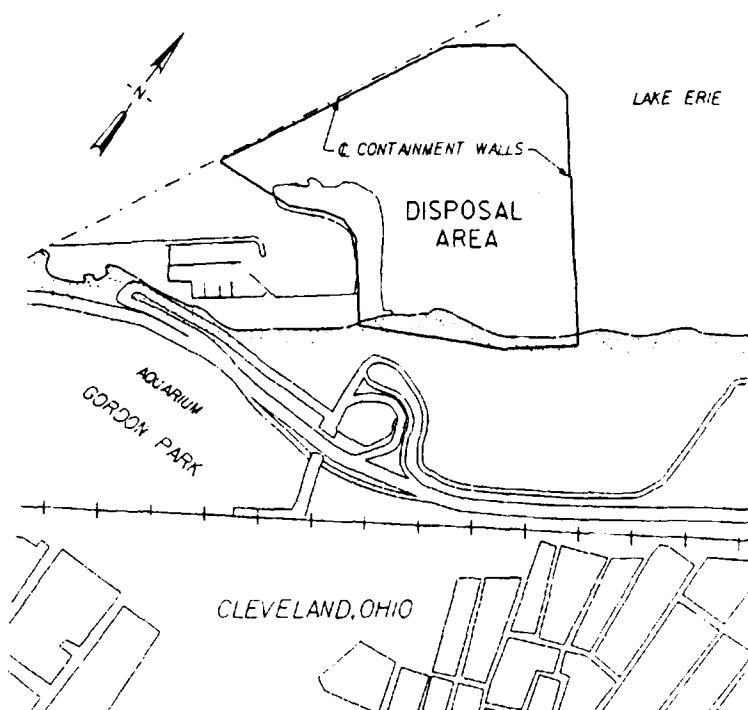


Figure 2. The Dike 14 CDF (the shaded area was the site of the avian botulism abatement pilot project)

Therefore, the differential in the levels of dredged material slurry on either side could not exceed 1 ft until the site had been filled to a depth sufficient to bury the culvert.

8. During 1986, the filling of the site reached the point that there were extensive areas of shallow water in the CDF. As the dredged material dewatered, areas of anaerobic mud flat were exposed, the mud flats attracted large numbers of birds, and an avian botulism

incident occurred. Lists of the species killed in the September 1986 outbreak are included in Table 1 and Appendix A.

Methods of control

9. Hunter et al.* extensively studied botulism in California and summarized techniques that have been used to reduce the severity of outbreaks. These methods are based on improvement of ponds and generally involve the maintenance of controlled water levels to minimize the presence of mud flats. Other approaches have included use of carbide cannons or other noisemakers, falconry, and effigies of predators to keep birds away, and removal of dead and/or infected birds to reduce sources of infection. All methods mentioned, while effective to varying extents, are neither compatible with the logistics of a typical maintenance dredging schedule nor easily converted to a standard operating procedure.

Objectives

10. The objectives of the pilot project were:
 - a. To demonstrate the use of vegetation to discourage waterfowl and shorebirds from landing on the site, reducing the incidence of avian botulism at CDFs.
 - b. To demonstrate the feasibility of the above approach as a standard operating procedure.
 - c. To evaluate the results of the approach when applied to a regularly scheduled dredging and disposal operation.

Approach

11. The techniques that have been suggested and/or applied to reduce the incidence of avian botulism have not been compatible with the operational requirements of a Corps of Engineers District. A District's dredging operations involve one or more contractors, and often several waterways must be dredged. There are also seasonal, construction, and/or environmental restrictions (or constraints) that must be met. Therefore, it is not possible to schedule the placement of dredged material into each CDF at the optimum period for the safety of all waterfowl and shorebird species that are attracted to the site.

12. CDF management usually does not consider the selection or control of colonizing species. As a result, birds are frequently attracted to new habitats provided by CDFs. Birds attracted to early successional habitats may develop dense populations on mud flats. Certain threatened and endangered species attracted to mud flats may also colonize contaminated sites in contaminated waterways. These are also locations where conditions favorable to the spread of naturally occurring diseases may temporarily occur.

13. The management of a CDF must be a continuing process that is based on the anticipation of the sequence of events that occur in the transition of the CDF from an

* Hunter, B. F., Clark, W. E., Perkins, P. J., and Coleman, P. R. 1970. "Applied Botulism Research Including Management and Recommendations - A Progress Report," Wildlife Management Branch, California Department of Fish and Game, The Resources Agency, Sacramento, CA.

aquatic to a terrestrial ecosystem. The reduction of the incidence of avian botulism is one goal of management; however, the processes managed cannot be separated from the other processes that occur at the CDF. It is critical that any habitat, either naturally occurring or specifically created, must be evaluated by answering the following questions:

- a. Which species will be excluded?
- b. Which species will be attracted?
- c. Will there be significant seasonal differences in species? (i.e., will the mud flat used for nesting by an endangered species in the spring be the site of botulism in late summer?)
- d. Are the habitats selected for pathogen abatement consistent with the management of the CDF to reduce contaminant mobility?
- e. Will a species be attracted that may be adversely affected by the area surrounding the CDF? (i.e., will species attracted to the CDF dike for nesting be adversely impacted by feeding in a nearby industrial area?)

14. Plant species were established in the areas of the Dike 14 CDF where it was anticipated that shallow water would exist after the 1987 dredging operations. The naturally occurring dewatering during late summer and early fall could contribute to a potential botulism problem. The plants introduced prior to the disposal operations were expected to colonize or emerge through the mud flats as the dredged material dewatered. The vegetated mud flats were expected to be unattractive to the wading birds susceptible to botulism, and to attract a diverse upland avifauna that would neither be susceptible to botulism nor adversely impacted by contaminants due to habitat and feeding preferences. All efforts to modify the postdisposal habitat with vegetation were applied without requiring either costly or time-consuming modifications in the CENCB operations schedule.

PART II: METHODOLOGY

Plant Species

15. A mix of plant species was selected to provide initial and long-term cover on the east side of the culvert (Figure 2). Annual grasses and wetland species were used to create the early successional conditions needed to enable the development of perennial species. These species were planted as seeds, roots, or stem cuttings (Table 2). Common reed (*Phragmites australis*) and sandbar willow (*Salix interior*) were planted as rhizomes and twig cuttings, respectively. All species chosen have either been found within the CDF (Table 3), or are commonly found in disturbed wetlands, and can produce dense vegetative cover.

16. The reed rhizomes were harvested at the Consumers Power Plant, Karns coal-fired electrical generating plant in Bay City, MI. Rhizomes were collected from a graveled road shoulder with a 3-point-hitch spring harrow attached to a 70-hp four-wheel-drive tractor. The tines of the spring harrow cut and lifted the dense rhizome mass from the gravel base. The rhizomes were then cut into 4- to 6-in. lengths, iced, packed in peat moss and stored in Styrofoam chests. The rhizomes were stored at Applied Ecological Services facilities (Juda, WI) at $44 \pm 2^\circ$ F for the 2-week period between collection and planting at Dike 14.

17. Willow cuttings were collected near Brodhead, WI, 2 days before planting at Dike 14. The willow was collected as whips 6 ft in length. After collection, half of the willow whips were cut to 1-ft lengths. All cuttings were packed on ice in Styrofoam chests until planting.

Equipment

18. Specialized equipment was assembled for planting seeds, cuttings, and rhizomes at Dike 14. A four-wheel-drive Honda all-terrain vehicle (ATV) fitted with rubber half-tracks (Tracker Industries) was used in planting areas containing standing water and/or unconsolidated dredged material (Photos 2 and 3). Loading rates of the ATV, plant material, and driver were 0.3 to 0.7/sq in. Seeding was accomplished with a 3-bushel cyclone seeder driven by a 5-hp Briggs and Stratton engine carried on the ATV. Rhizomes and 1- and 6-ft willow cuttings were planted by hand from the ATV.

19. A four-wheel-drive Pasquali tractor, with dual wheels, was used in the more consolidated areas to plant reed rhizomes and willow cuttings (Photos 4 and 5). A 3-point-hitch strawberry planter was modified and attached to the tractor as a single row planter. The planter's colter disc opened substrates for insertion of rhizomes and cuttings and packing wheels pressed the substrate around the plant materials. Rhizomes or cuttings could be planted at the rate of up to 3,000/hr.

20. A draw-bar-mounted spring harrow was used to rip the surface 3 to 4 in. of the consolidated substrate at the 1986 botulism problem area, and in the relatively dry south end of the CDF (Photo 6). This tool produced a corrugated seed bed and incorporated the seed into the upper inch of the substrate. A 7.5-ft tined drag was pulled by the ATV in areas too wet to harrow in order to provide microtopographic relief for seed incorporation.

Planting Schedule and Rates

21. Planting was initiated 18 May and completed 21 May 1987. Seeding rates (lb/acre) and the approximate numbers of cuttings and rhizomes are shown in Table 2. The seed mix was homogenized by hand in the hopper of the seeder and then spread at a uniform rate. A 30- to 40-ft seed spread width was typical and provided relatively uniform coverage.

PART III: RESULTS AND DISCUSSION

Planting Strategy Feasibility

22. Three days were required for a crew of five persons to collect and prepare the propagules, and 4 days, 17-21 May 1987, were required for planting by two persons. Five hours were required to till the consolidated portions of the CDF (approximately 20 acres). Seeding required roughly 10-15 min per acre including loading, seed mixing, and spreading. Rhizomes and cuttings were planted at rates of 800 to 3,000 plants per hour depending on the substrate conditions.

23. The dredged material along the northern edge of the dike was neither drivable nor walkable and was covered by 1 to 3 ft of water. The unconsolidated material in this area clogged the ATV track grousers and the vehicle buried itself. Use of a winch and cable to pull the ATV was sufficient to permit planting activities in unconsolidated areas. Prevailing winds and waves were also used to distribute propagules in ponded areas.

Dredging Operations

24. Dredged material disposal operations began 29 May 1987, 8 days after the completion of planting, and continued through 31 July. The dredging contractor, Great Lakes Dredge and Dock, placed 320,000 yd³ of dredged material in the CDF; 220,000 yd³ were dredged from the Cuyahoga River and the remaining 100,000 yd³ were from the Cleveland outer harbor. The unplanted portion of the site (approximately 35 acres west of the Doan Brook culvert) was filled first (Figure 2). Dredged material was then alternately pumped to the east and west halves to maintain equal hydrostatic pressure on the culvert (± 1 ft). Within a month, the dredged material completely overflowed the culvert. By the time the disposal operations were completed, most of the planted area east of the culvert was covered by up to 6 ft of dredged material, or was flooded.

25. By 2 September the CDF had dewatered and the dredged material consolidated. The Doan Brook culvert was covered, there were no shallow areas of standing water to attract wading birds, and there were no indications of avian botulism. Some planted vegetation had emerged through the dredged material.

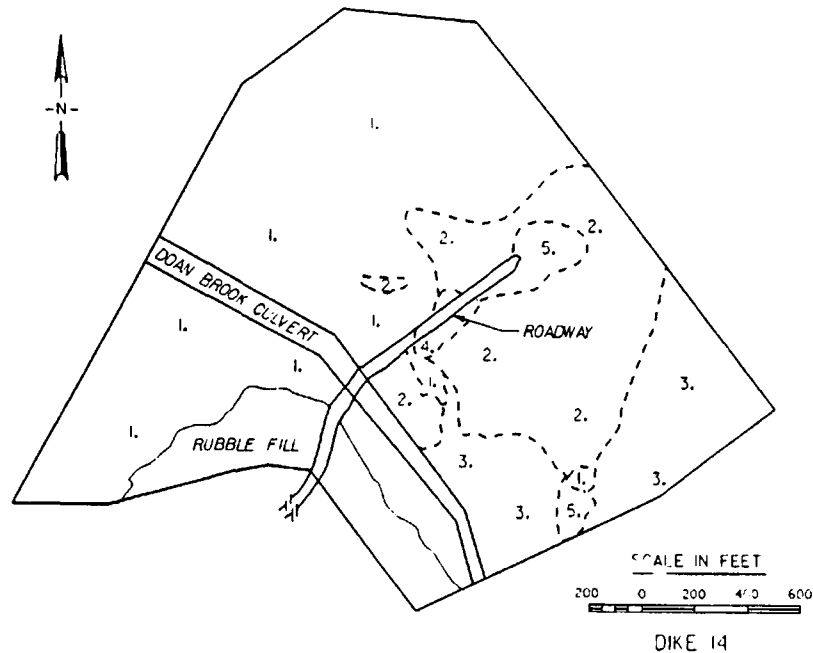
26. The pilot project was evaluated at the end of the growing season (26 October 1987). During the disposal operations the CDF was filled level with the culvert. The north end of the east half (planted) and the west half (unplanted) of the CDF each received up to 6 ft of dredged material. In the east half of the CDF, depths of dredged material decreased with increased distance from the dredge pipe. The gravel access road in the east half of the CDF supported lush vegetation that apparently acted to filter suspended material so that the south 30 acres of the east half experienced only intermittent flooding.

Vegetation

27. Vegetation was not established during the 1987 growing season in areas where deep burial occurred (Photo 7). Only vegetation capable of growing through shallow burial was evident in October (Figure 3 and Photo 8). Smartweed species were able to sprout adventitious roots along the stems and incrementally grew through over 3 ft of

Figure 3. Vegetation at the
Dike 14 CDF
26 October 1987

- Key:
1. Dry mud flat, unvegetated
 2. Dominant plant, smartweed (*Polygonum*)
 3. Dominant plant barnyard grass (*Echinochloa*)
 4. Dominant plant giant reed (*Phragmites*)
 5. Dominant plants cottonwood (*Populus*) and willow (*Salix*)



dredged material. In areas of shallow dredged material deposits, smartweed and barnyard grass were present in dense stands. Interspersed in these stands were reeds and willow from the spring planting.

28. Seeds of smartweed and barnyard grass littered the substrate throughout the CDF. The seeds in and on the substrate produced by the vegetation planted in 1987 germinated in spring 1988, and by 26 June 1988, 75 percent of the site was vegetated (Photo 9). The reed and willow propagules expected to emerge in 1988 were not evident, and the vegetation was composed mainly of grasses and cattails with isolated stands of reed and willow. Observations made 31 August, after disposal operations were completed, indicated that smartweed was the most prevalent species. Areas of *Phragmites* and willow had expanded, and approximately 75-80 percent of the CDF was vegetated (Photo 10). On 31 August there was no standing water on the site and the only shorebirds or waterfowl present were gulls resting in the dry but unvegetated area left by the most recent (1988) disposal operations.

29. It is interesting to note that, while areas of comparably sized willows and cottonwoods were partially buried by the dredged material, only the willows survived.

Avifauna

30. The combination of increased dredged material elevation relative to the lake level and the dense growths of planted and volunteer grasses and forbs substantially changed the bird habitat. Foraging shorebirds and waterfowl were no longer the most numerous birds at the CDF. Bird watchers at the CDF noticed a shift in the avifauna to species of sparrows, finches, other songbirds, and doves. These bird groups generally feed on seeds or terrestrial insects and therefore do not usually contract avian botulism. Detailed lists

of species have been compiled by the local Cleveland bird watchers. The observations of one volunteer bird bander confirm the magnitude of the change. Jerry Talkington, a volunteer bird bander for the US Fish and Wildlife Service, banded a great many shorebirds and only about 100 sparrows at Dike 14 in 1986. In fall 1987, in 1 day, almost 400 sparrows were banded and by 26 October 1987, Mr. Talkington had banded 17 different sparrow species (Photo 11). William A. and Nancy R. Klamm of Lakewood, OH, have maintained detailed records of the birds observed at Dike 14. Their records for 1986, 1987, and 1988 through September are included as Appendix D. These records document the changes in avifauna visitations that have occurred with the filling of Dike 14 and the related vegetational changes. The Klamm's records confirm the changes in avifauna from various lakeshore-related species to upland birds that have accompanied the filling of the CDF. In particular, long-term records such as these document the presence of stages of finite length or "windows" in the life cycle of a CDF when management of colonizing species may be necessary.

PART IV: CONCLUSIONS AND RECOMMENDATIONS

31. The pilot project was a qualified success in the establishment of vegetation at Dike 14. The duration of the disposal operation and the depth of the dredged material limited the anticipated vegetation establishment. The final elevation of the dredged material relative to the lake level allowed the site to dewater rapidly and the vegetation attracted a different avifauna. The observed botulism abatement was the result of both additional filling and vegetation establishment.

32. The procedures used to establish vegetation were feasible and cost-effective. A unique combination of equipment was required, but all of the components were readily available.

33. Ideally, division of a CDF into two cells would permit the use of one cell for disposal while vegetation developed on the other. This would allow both cells to be vegetated during the critical stage in CDF development when shallow water and mud flats are the only features present. This approach is often not possible due to construction or operational constraints. Therefore, it is critical that the botulism "window" is identified and action is taken before the first outbreak. At Dike 14, an effort to establish emergent vegetation would have been most effective in the spring of 1986.

34. The procedures applied at Dike 14 require fine tuning before they can be considered standard operating procedures. The procedures can be further defined through application at other CDFs where conditions that favor botulism can occur.

35. The pilot project described was a field test of methodology that could contribute toward either preventing or reducing the potential of avian botulism outbreaks at CDFs.

Table 1
Birds Killed in the September 1986 Avian Botulism Outbreak

<u>Number Dead</u>	<u>Common Name</u>	<u>Species</u>
13	Semipalmated plover	<i>Charadrius semipalmatus</i>
12	Spotted sanderling	<i>Calidris</i> sp.
7	Sanderling	<i>Calidris alba</i>
3	Pectoral sandpiper	<i>Calidris melanotos</i>
2	Least sandpiper	<i>Calidris minutilla</i>
2	Ruddy turnstone	<i>Arenaria interpres</i>
2	Mute swan	<i>Cygnus olor</i>
1	Stilt sandpiper	<i>Micropalama himantopus</i>
1	Lesser yellowlegs	<i>Tringa flavipes</i>
1	Knot	<i>Calidris canutus</i>
1	Canada goose	<i>Brantia canadensis</i>
1?	Mallard	<i>Anas platyrhynchos</i>
1?	Ring-billed gull	<i>Larus delawarensis</i>

NOTE: List compiled from data provided by the Cleveland Museum of Natural History, a more extensive description of the outbreak and list of bird species involved is given in the US Fish and Wildlife Service Columbus Field Office Report included as Appendixes A-D. The total number of dead birds was estimated to be between 687 and 716.

Table 2
Species Selected for the Vegetation of the Dike 14 CDF

<u>Common Name</u>	<u>Species</u>	<u>Planting Rate per Acre for 45-Acre CDF lb/acre</u>
Italian rye grass	<i>Lolium multiflorum</i>	11.00
Bentgrass	<i>Agrostis</i> sp.	0.90
Bulrush	<i>Scirpus atrovirens</i>	0.10
Wool grass	<i>Scirpus cyperinus</i>	0.10
Barnyard grass	<i>Echinochloa crusgalli</i>	20.00
Smartweed	<i>Polygonum pennsylvanicum</i>	5.00
Reed canary grass	<i>Phalaris arundinaceae</i>	2.00
Rice cutgrass	<i>Leersia oryzoides</i>	0.04
Switchgrass/Cocklebur	<i>Panicum virgatum</i> <i>Xanthium</i> sp. mixture	0.40
Common reed	<i>Phragmites australis</i>	3,350 rhizomes
Sandbar willow	<i>Salix interior</i>	3,350 cuttings

Table 3
Inventory of Plant Species Present on the Dike 14 CDF
Estimates Made February 1987

<u>Common Name</u>	<u>Species</u>	<u>Percent Cover</u>
Mudflat Area		
Cocklebur	<i>Xanthium strumarium</i>	<20 to <5
Shepherd's purse	<i>Capsella bursa pastoris</i>	
Barnyard grass	<i>Echinochloa crusgalli*</i>	
American wormseed	<i>Chenopodium ambrosioides</i>	
Beggar's ticks	<i>Bidens</i> sp.	
Smartweed	<i>Polygonum lapathifolium</i>	
Coarse-grain-size material		
Sandbar willow	<i>Salix interior*</i>	50-100
Cottonwood	<i>Populus deltoides*</i>	
Reed canary grass	<i>Phalaris arundinacea*</i>	
Common reed	<i>Phragmites australis*</i>	
Purple Loosestrife	<i>Lythrium salicaria</i>	
Rice cutgrass	<i>Leersia oryzoides*</i>	
Cocklebur	<i>Xanthium strumarium</i>	
Love grass	<i>Eragrostis hypnoides</i>	
Bog rush	<i>Juncus</i> sp.	
Aster	<i>Aster pilosus</i>	
Fine-grain-size material		
Broad-leaved cattail	<i>Typha latifolia</i>	100
Narrow-leaved cattail	<i>Typha angustifolia</i>	
Common reed	<i>Phragmites australis*</i>	
Buttercup	<i>Ranunculus rhomboideus</i>	
Bog rush	<i>Juncus</i> sp.	
Three-square	<i>Scirpus americanus</i>	
Smartweed	<i>Polygonum lapathifolium</i>	

* Species selected for site vegetation.



Photo 1. Dike 14 CDF. The concrete structure on the right is the Doan Brook culvert that divides the Dike 14 CDF into east and west portions. The west portion is shown in this photograph. The CDF dike is in the background



Photo 2. The Honda ATV with half tracks as used in the pilot project. The 3-bushel cyclone seeder is mounted on the ATV. This equipment was used in planting unconsolidated mud flats and ponded areas



Photo 3. The Honda ATV operating in water depths of 1-2 ft



Photo 4. The four-wheel-drive articulated Pasquali tractor with dual wheels
as used in the pilot project

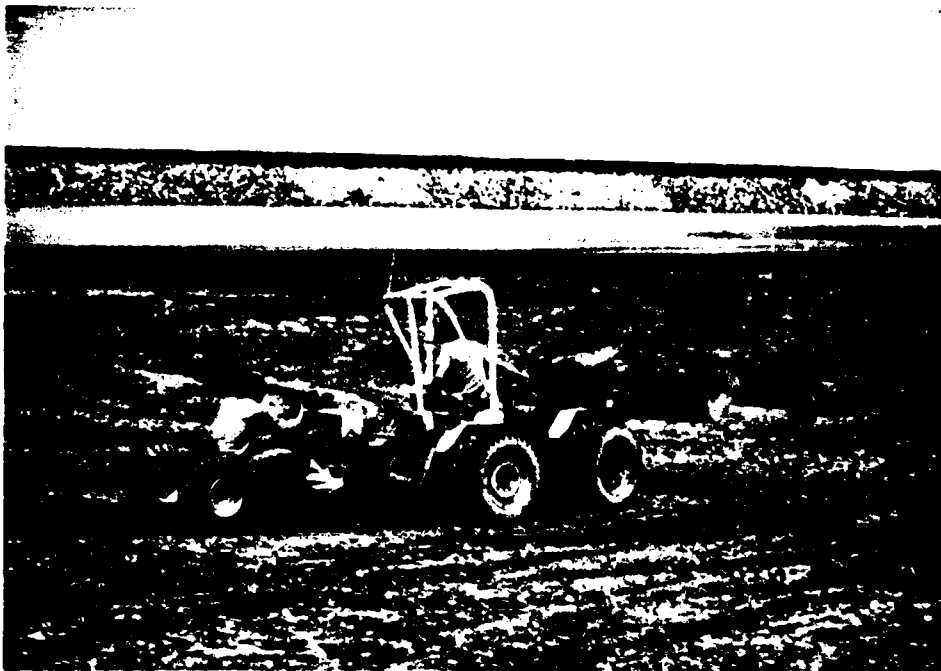


Photo 5. A three-point-hitch modified strawberry planter was used with the Pasquali tractor to plant cuttings and rhizomes in the relatively consolidated portions of the CDF



Photo 6. A 30-hp four-wheel-drive Pasquali tractor was used to pull a modified spring harrow to break up consolidated surface material before planting. This equipment could only be used in the drier areas of the CDF



Photo 7. Planted areas receiving 3-6 ft of dredged material had not become well vegetated by 26 October 1987. There were, however, no areas of standing water and no botulism reported



Photo 8. Planted areas receiving 1 ft of dredged material or less produced relatively lush vegetation in the short time between the completion of the disposal operations and the end of the growing season



Photo 9. Vegetation at Dike 14 during disposal operations (June 1988)



Photo 10. Vegetation at Dike 14 at maximum vegetational growth, September 1988.
As in October 1987, there were no areas of standing water and the site was
not used by bird species susceptible to avian botulism



Photo 11. Dense grass and forb vegetation substantially changed the bird habitat. Volunteer bird banders captured, marked, and released many seed-eating birds and a few wading birds in 1987. During fall 1987, sparrows representing 17 species were banded

APPENDIX A
US FISH AND WILDLIFE SERVICE REPORT
ON THE 1986 AVIAN BOTULISM OUTBREAK
AT DIKE 14

An Account of the Botulism Outbreak at the Cleveland, Ohio Confined Disposal Facility in 1986

by William J. Kurey, US Fish and Wildlife Service, February 1987

Clostridium botulinum type C is the bacterium that produces the toxin responsible for mass waterfowl deaths. There are six different strains of this bacterium labeled A through F on the basis of the neurotoxins they produce. The disease known as avian botulism, western duck sickness, or limberneck is caused by the neurotoxin, not by bacterial infection.

Botulism tends to ignite in areas that have not been recently flooded or where water levels fluctuate along a feather edge shore (as in Cleveland CDF). Other conditions conducive to a botulism outbreak include:

- a. Warm temperatures - 60° to 90° F (winter botulism outbreaks are thought to be caused by still-active toxin produced under warm conditions earlier).
- b. pH of 5.7 to 8.0.
- c. Suitable nutrient medium consisting almost entirely of animal matter.
- d. Vertebrate as well as invertebrate carcasses.

Flooding of dry land drowns terrestrial invertebrates that then become incubators for the anaerobic botulism bacteria. Botulism can be a problem in water depths up to about 18 in. The decomposition process uses up available oxygen, and bacterial spores ingested during the life of the animal germinate after death. Botulism outbreaks begin when birds feed directly on invertebrate carcasses or live invertebrates containing toxin and are killed, thus providing additional places for *C. botulinum* to grow. The outbreak gathers momentum as maggots and other invertebrates concentrate toxin from bird carcasses on which they have been feeding. Ingesting just two to five of these toxin-bearing maggots can kill a duck and more than 5,000 maggots can be produced by a single duck carcass. Once an outbreak occurs it is necessary to remove waterfowl carcasses to break the fly/maggot cycle.

The only positive diagnosis is a laboratory procedure using mice and antitoxin. Signs of botulism intoxication in waterfowl include:

- a. Sick birds are of normal weight.
- b. Sick birds don't eat.
- c. Sick birds have trouble holding their head erect, hence the term limber neck. Leg weakness and wing droop progresses to flaccid paralysis. The nictitating membrane over the eye ceases its rhythmic functioning.

Some sick birds can recover from botulism if given the opportunity. There are three stages of the disease:

- Class 1. Birds that can walk but not fly. These birds can recover without special treatment.

Class 2. Birds that suffer a greater degree of paralysis; difficulty walking and usually row their wings. These birds may recover with oral administrations of fresh water.

Class 3. These birds are almost completely immobilized and require intraperitoneal injection of antitoxin to survive.

The Cleveland confined disposal facility (CDF) is a diked enclosure for sediments dredged from the harbor to maintain navigable depths. It is known as Dike 14 to the US Army Corps of Engineers and covers an area of about 88 acres. The northwest lagoon is about 9 acres in size and contains open water over 3 ft deep. Cattail marsh and shallow water areas fringe the south shore of this lagoon. The large east lagoon is about 55 acres in size with several acres of brushy vegetation in the central area: the rest is unvegetated sediment, some hard enough to walk on but mostly mud. Open water, from 10 in. deep along the north dike feathering to 0 in. southward, covered about 10 to 15 acres. The depth and extent of this ponded water varied with the elevation of Lake Erie due to the permeability of the dikes. It was this area that appeared to be the source of the botulism problem, although some carcasses were also found in areas of the west lagoon.

According to Bill McDonald (Buffalo District), prior to the summer of 1986 the east lagoon was full of water. Indeed, aerial photographs of the CDF taken in March or April of 1986 show it was covered with water except for a relatively small area in the center of the east lagoon. He also mentioned that he thought that the amount of sand in the dredged sediments was greater in earlier years.

Botulism does not appear to have been a problem at the Cleveland CDF prior to 1986. However, there have been outbreaks at the Saginaw, MI CDF and the Toledo, OH CDF in previous years.

The US Fish and Wildlife Service (USFWS) involvement in the botulism outbreak began on August 12, 1986, but the problem might have existed for 2 weeks or more before USFWS personnel were informed. The problem was brought to the attention of the USFWS by Mr. Dick Bartz of the Ohio Department of Natural Resources (ODNR) who was advised by an employee that he and local bird watchers had noticed the birds dying in the Cleveland CDF.

On August 14, the USFWS met on site with representatives of the Ohio Division of Wildlife (ODOW), ODNR, and the Army Corps of Engineers. The Corps agreed to collect and dispose of carcasses and to try to scare the birds. The ODOW provided a propane cannon that day; eventually, there were four at our disposal.

On the day of the meeting we counted about 65 carcasses using binoculars and a spotting scope; mostly shorebirds were observed, perhaps 15 percent were ducks and geese. A few shorebirds were alive in varying stages of paralysis and displaying typical signs of botulism intoxication. Sick birds tried to hide under vegetation, and those that could not reach shelter died on the mud flats and were not retrievable. The broad expanse of mud flats was the complicating factor in all of this. There was no way to cross the mud to search for dead birds.

The USFWS returned on August 18 and 19 with two 12-gauge shotguns and cracker-shells for frightening off the birds. The USFWS scared birds and left this equipment with

the Corps for their use. Two cases of crackershells (1,000 rounds) with a replacement value of over \$500 were expended over the 46 days they were in use. Eight shorebird carcasses were picked up for submission to the National Wildlife Health Center (NWHC) for necropsy. By September 4, the NWHC had confirmed type C botulism as the cause of death.

The Corps reluctantly agreed to use the propane cannons because of disturbance complaints from a residential area. The propane cannons appeared to be effective in keeping ducks and geese out of the CDF, but shorebirds were unimpressed. Shorebirds were also unimpressed by the use of reflective tape, and even crackershells served to move them only short distances on most occasions. A good deal of the area used by shorebirds (the mud flats) was out of range of the crackershells. The dike walls are hazardous to walk over and could not be used to access remote parts of the CDF.

The USFWS made several more trips to the CDF on August 22, August 29, September 4, and September 10. On August 29, Mr. Bill Kurey of the USFWS Columbus office was interviewed for television about the situation. On a later trip, a fishing rod and reel were employed to retrieve some dead birds that were out of reach (treble hook on the end and several split shot sinkers just in front of it). An attempt was made to use a boat to retrieve carcasses which was effective on the west lagoon but unsuccessful in the east because declining water depth make boat launching impossible. Between August 12 and 29, lake level (and therefore CDF level) decreased 4 in.

Records of CDF water temperature range from 73° to 36° F in the east lagoon during the times measured. Oxygen levels in the west lagoon ranged from 12.2 - 12.8 ppm at the surface to 8.0 - 9.5 ppm at the 3-ft depth on the only day measurements were taken. Good measurements were impossible in the east lagoon because of shallowness and inaccessibility. The east lagoon was well mixed by wind, and high oxygen levels would have been expected. It is suspected that the east lagoon would have very little oxygen in the water after several days of calm weather and high temperatures. However, the oxygen level in standing water may have little significance to the progress of the botulism bacteria. These bacteria thrive primarily in the moist mud zone between the water's edge and the dry soil, an area free of the diluting and head-insulating effects of the water. Reflooding makes this botulism-laden area attractive to waterfowl.

On August 24, contractors were engaged by the Corps to take over the job of scaring birds and searching for carcasses. These efforts continued until October 3. Good records are available of the number of birds collected daily from August 24 to Oct 3 (41 days). Although weather conditions or other factors affected collections on some days, it is felt that the number of carcasses collected was an accurate indication of the relative numbers of birds dying from botulism (especially when taken on a weekly basis). These collections were a relative number because an unknown number of the birds died in the mud and could not be retrieved.

A total of 543 dead birds were collected over a period of 41 days. Counts of the earlier mortality add 143 (Corps count) to 173 (USFWS count) to this number. Therefore, we know that from 687 to 716 birds died; but the real number could be higher by several hundred owing to the difficulty presented by the mud flats in getting an accurate count.

Most of the affected birds (a crude estimate is 90 percent) were shorebirds the size of sandpipers, very small and easily overlooked, and this was another complicating factor.

The following list of some birds in the Cleveland CDF area was made by Ann Bugada (Lake County Metropolitan Parks) on August 19:

<u>Observed Dead</u>	<u>Observed Alive</u>
Canada goose	Semipalmated sandpiper
Mallard	Semipalmated plover
Ring-billed gull	Ring-billed gull
Semipalmated sandpiper	Lesser yellowlegs
Semipalmated plover	Pectoral sandpiper
	Black-bellied plover
	Bonapartes gull
	Herring gull
	Killdeer
	Mute swan
	Sandpiper sp.
	Great blue heron
	Green heron
	Red-winged blackbird
	Flicker
	Swallow sp.

The two mute swans could not be scared out of the area and eventually died. Some other species were also in the area, including what might have been a falcon (species unknown) which was observed to stoop on a distant group of shorebirds causing them to rise and move out of the area, and the Federally endangered piping plover. The source of the piping plover report also saw marbled godwits, lesser golden plover, and red phalarope in early September. This person was a bird bander who had encountered a total of three piping plover at the CDF in 1986. He saw one in April or May, and two in early August which were sick with botulism. These two birds were banded and nursed back to health by force-feeding flies with tweezers. They were released at Lake Rockwell near Kent, OH, on September 24.

The botulism problem at Cleveland lasted from prior to August 12 to October 3 - about 44 days. About 700 migratory birds, mostly shorebirds, are known to have perished. The Federally endangered species piping plover was among the shorebirds involved, although there was no mortality.

The conditions that led to the 1986 botulism outbreak in Cleveland could exist again in 1987. In order to try to avoid these conditions, the Corps plans to maintain more of a slope on the CDF from the point where sediment filling occurs, and possibly to dredge later in the season to maintain the water level in the CDF. It is expected that up to 300,000 yd³ of sediment could be added to the CDF in 1987.

Mr. John Simmers of the US Army Engineer Waterways Experiment Station in Vicksburg, MS, has suggested that Phragmites sp. might be planted in the CDF to aid

dewatering and make the area unattractive to shorebirds. The Buffalo District has made no decision on this proposal yet.

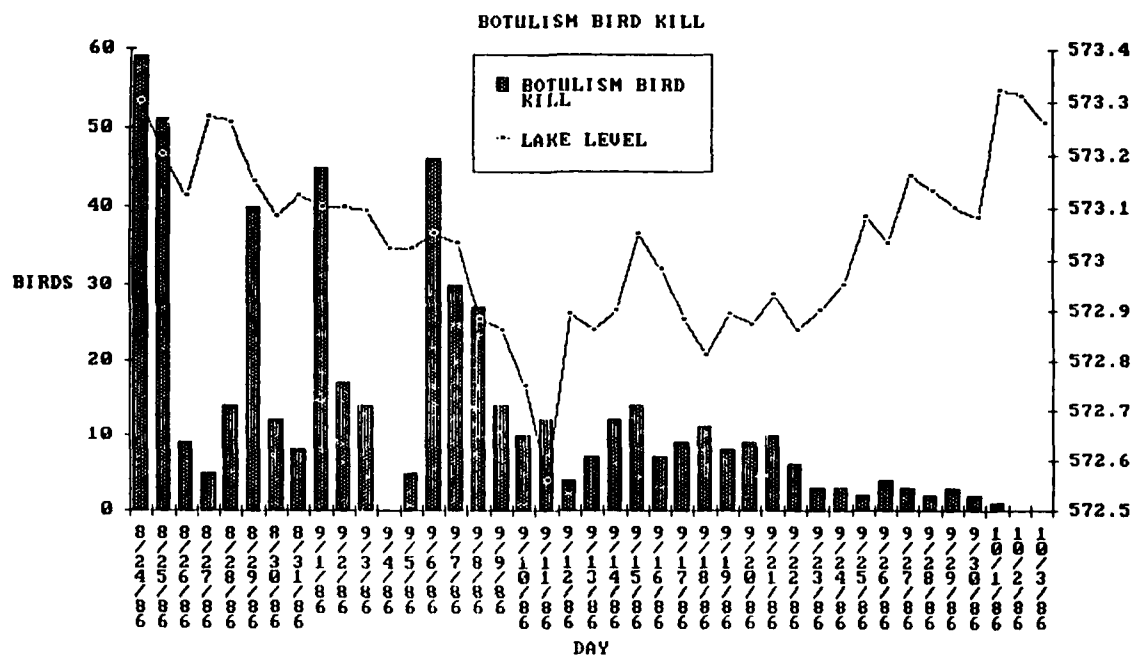


Figure A1. Botulism bird kill

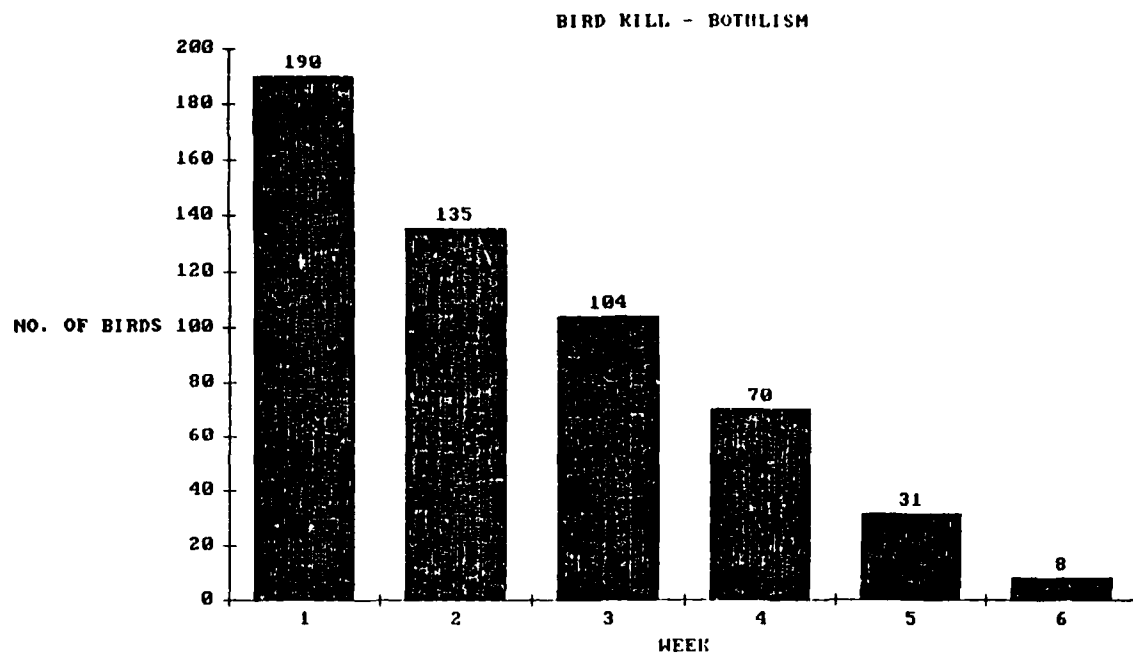


Figure A2. Deaths due to botulism, per week

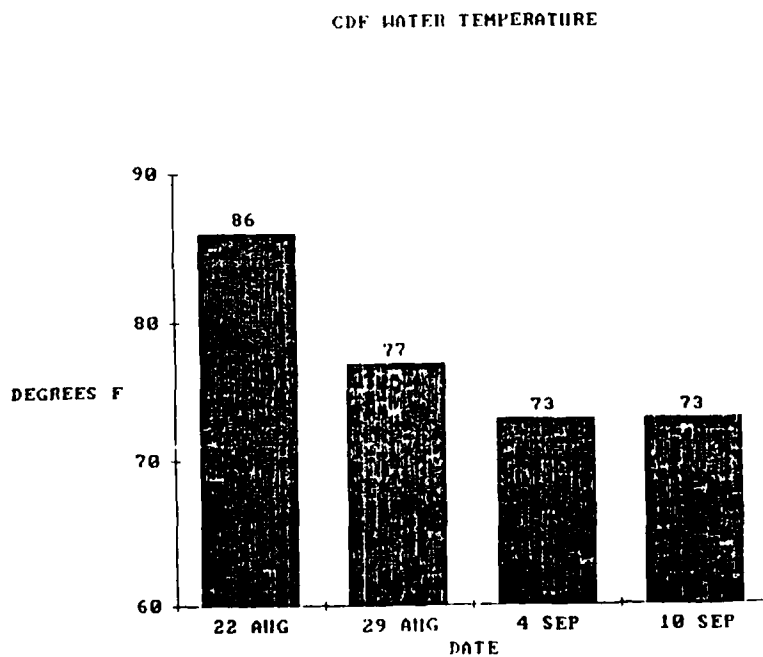


Figure A3. CDF water temperature

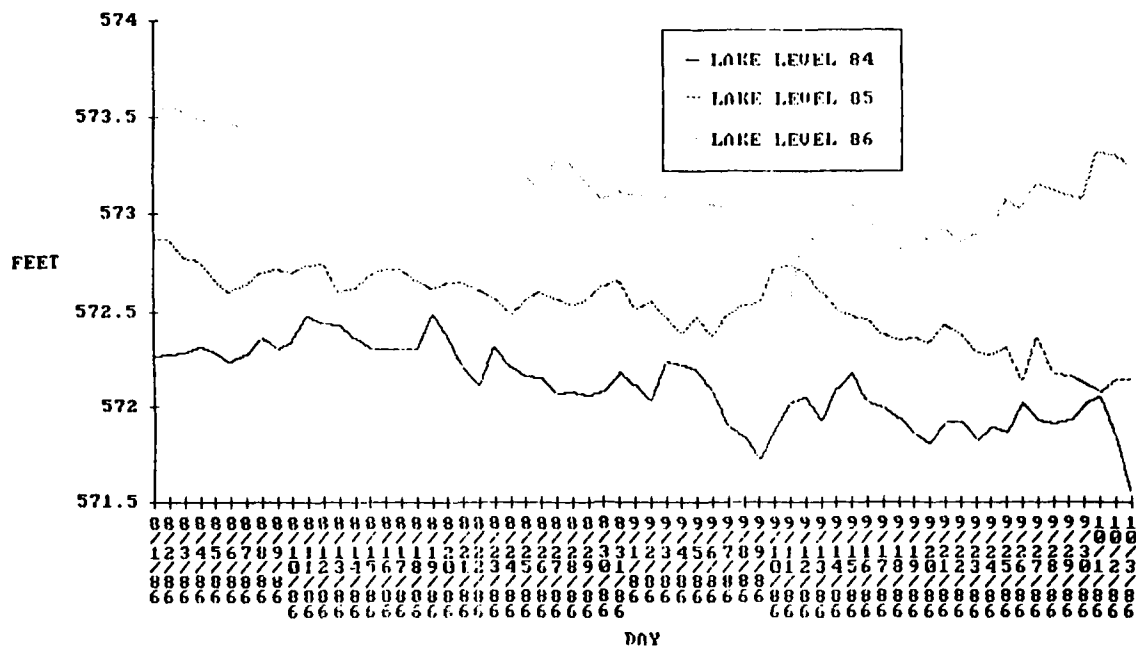


Figure A4. Water level at Dike 14 CDF

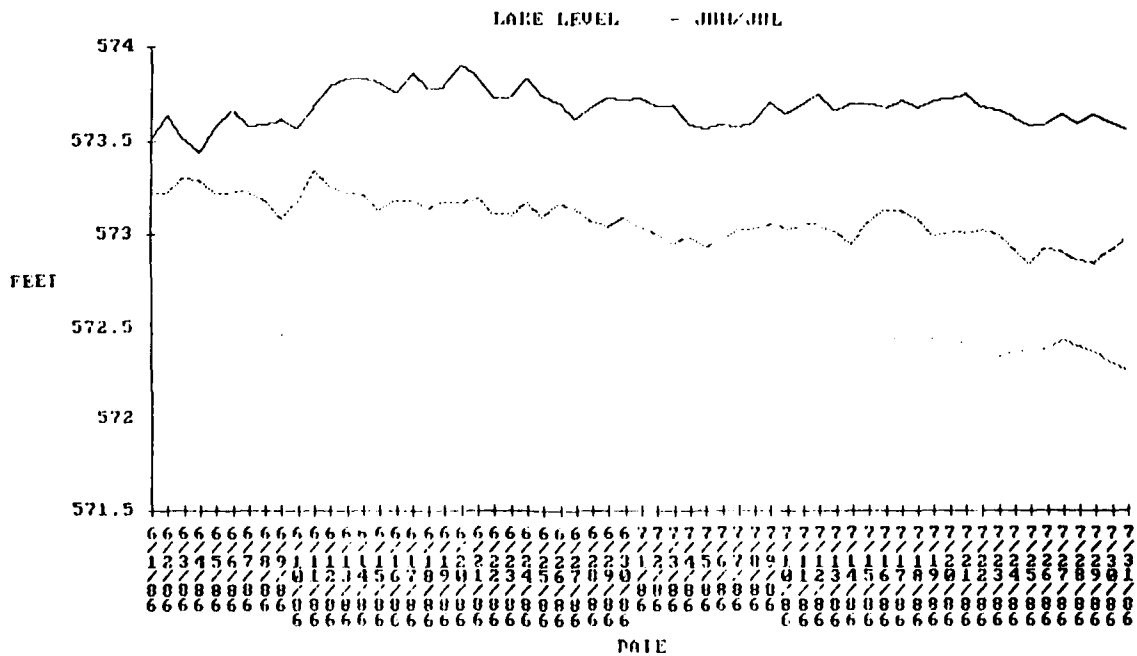


Figure A5. Water level, June and July, 1986

APPENDIX B
DOCUMENTATION OF THE NUMBER OF BIRDS KILLED
AT DIKE 14



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207-3199

NCBPD-ER

24 NOV 1986

SUBJECT: Cleveland Dike 14 Botulism Problem

Mr. Kent Kroonemeyer
Field Supervisor
U.S. Fish and Wildlife Service
Division of Ecological Services
3990 East Broad Street
Columbus, OH 43212

Dear Mr. Kroonemeyer:

I have enclosed a copy of the day-by-day summary of the number of birds collected by our contractor at the Cleveland, Ohio CDF this past summer as requested. Your continued interest and assistance is greatly appreciated.

My point of contact pertaining to this matter is Mr. William F. MacDonald of my Environmental Resources Branch, who can be contacted by calling commercial number (716)876-5454, extension 2175 or by writing to:

District Commander
U.S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, NY 14207-3199
ATTN: Mr. William F. MacDonald

The Buffalo District -- Leadership in Engineering.

Sincerely,

DANIEL R. CLARK
Colonel, Corps of Engineers
District Commander

Enclosure
as stated

Dead Birds (August 24 - October 3, 1986)

(only pickup burn)

Date	Day	No. of birds
8/24	Sun	59
8/25	Mon	51
8/26	Tue	9 by 9AM
8/27	Wed	5 ducks (2 from park) (1 sent to Vet. by State)
8/28	Thu	14 by 10AM
8/29	Fri	40 birds & 2 ducks
8/30	Sat	12
8/31	Sun	8
9/1	Mon	45
9/2	Tue	17
9/3	Wed	14
9/4	Thu	0
9/5	Fri	5
9/6	Sat	46
9/7	Sun	30
9/8	Mon	27
9/9	Tue	14
9/10	Wed	10
9/11	Thu	12
9/12	Fri	4
9/13	Sat	7
9/14	Sun	12
9/15	Mon	14
9/16	Tue	7
9/17	Wed	9
9/18	Thu	11
9/19	Fri	8
9/20	Sat	9
9/21	Sun	10
9/22	Mon	6
9/23	Tue	3
9/24	Wed	3
9/25	Thu	2
9/26	Fri	4
9/27	Sat	3
9/28	Sun	2
9/29	Mon	3
9/30	Tue	2
10/1	Wed	1
10/2	Thu	0
10/3	Fri	0

APPENDIX C
DIAGNOSTIC SERVICES CASE REPORTS,
NATIONAL WILDLIFE HEALTH CENTER,
US FISH AND WILDLIFE SERVICE

DIAGNOSTIC SERVICES CASE REPORT

RHT: PG/JCF

Location: Corps of Engineer confined disposal facility, Cleveland, OH.

Liver samples from birds 001, 002, 005, 006 and 007 were analyzed for lead. Concentration of lead found in the livers of birds 001, 005, and 007 are within normal background range. No lead was detected in livers of birds 002 and 006.

If you have questions regarding this case, contact P. A. Gullett, D.V.M.
at 608-271-4640 (FTS 364-5418). Include above Case Number.

NATIONAL WILDLIFE HEALTH CENTER - NECROPSY REPORT

Submitter's Name, Affiliation Address

Ken Multerer
Bill Curry
FWS-RCA
3990 E. Brood Street
Columbus, OH 43216

Case: 6546
Accession: 001
Collected: 8/14/86
Exam Date: (8/20/86)
Pathologist: LNL / A/L

Species: Short-bill dowitcher Specimen: Carcass
Bandtype: (E) Ref/Band No: () Botl Euth: (N) Weight: (Gm) (90)

History Summary: The submitter suspects a botulism die-off. Lagoon has shallow water - dredging materials stored in this area. There has been a history of toxic problems. Clinical signs, some green vents and limberneck observed. Mortality location: Corps of Engineer confined disposal facility near Cleveland, Ohio.

External/Internal Observations - Laboratory Results

External: No significant findings (NSF).

Internal/Musculoskeletal system: Pectoral muscles are moderately reduced +2. There is a moderate amount of subcutaneous fat. No fractures found. There were maggots in the oral cavity around the vent.

Cardiovascular system: A small amount of coronary fat was present. No obvious lesions seen in the heart muscle.

Respiratory system: Marked postmortem changes in the lung. There is some postmortem accumulation of bloody fluid in the ventral portion of the lungs.

Digestive system: Liver - Early postmortem changes, no obvious lesions seen. Gall bladder - normal. There is a small amount of abdominal fat present. Esophagus and proventriculus are gross normal. Gizzard - Gizzard lining is stained dark blackish-blue due to postmortem change. No lead or steel present in the gizzard. Intestinal tract - Postmortem changes.

Urogenital system: Gonads are those of a non-breeding adult male. Kidneys - Early postmortem changes.

BACTERIOLOGY: Heart Pool- Clostridium botulinum C (Positive).

TOXICOLOGY: Liver Lead- .18 ppm wet wt; .60 ppm dry wt.

Preliminary Diagnosis: Suspect botulism

Sex (M) Age (A)/() Body Cond. (G) Postmortem State (F) Giz. Lead (0)/(0)

Samples Saved:

1. Bact: heart-bot	4. _____
2. Tox: liver-Pb	5. _____
3. _____	6. _____

Final Diagnosis (order of importance)

	topog.	morph.	Exam type (GQ)		disea
			etiol.	funct.	
1. <u>Type C botulism</u>	()	()	()	()	()
2. _____	()	()	()	()	()
3. _____	()	()	()	()	()

NATIONAL WILDLIFE HEALTH CENTER - NECROPSY REPORT

Submitter's Name, Affiliation Address

Ken Multerer
Bill Curry
USFWS-RCA
3990 E. Brood Street
Columbus, OH 43216

Case: 6546
Accession: 002
Collected: 8/14/86
Exam Date: (8/20/86)
Pathologist: LNL *4/2*

Species: Short-bill dowitcher Specimen: Carcass
Bandtype: C, Ref/Band No: (Bot2) Euth: (N) Weight: (Gm) (110)
History Summary: See 001.

External/Internal Observations - Laboratory Results

External: Prominent sternal keel.

Internal/Musculoskeletal system: Pectoral muscles are markedly reduced +3. There is some subcutaneous fat still present. There are no fractures of the wing or leg bones.
Cardiovascular system: Normal - Small amount of coronary fat present.
Respiratory system: Normal
Abdominal cavity: Liver - Grossly normal. Gall bladder is enlarged and filled with greenish bile. Abdominal fat is absent. Esophagus, proventriculus are normal. Gizzard - Gizzard lining is dull tan-brown in color. No ingested lead or steel shot present. Intestinal tract - Grossly normal.
Urogenital system: Gonads are those of a non-breeding adult female. Ovary - Normal. Follicles 1 mm or less in diameter. Kidneys - Grossly normal.
BACTERIOLOGY: Heart Pool- Clostridium botulinum C (Positive).
TOXICOLOGY: Liver Lead- Not Detected.

Preliminary Diagnosis: Suspect botulism

Sex (F) Age (A)/() Body Cond. (P) Postmortem State (G) Giz. Lead (0)/(0)

Samples Saved:

- | | |
|----------------------------------|----------|
| 1. Bact: heart-bot | 4. _____ |
| 2. Tox: liver-Pb | 5. _____ |
| 3. Hist: kidney (renal coccidia) | 6. _____ |

Final Diagnosis (order of importance)

	topog.	morph.	Exam type (G03)		
			etiol.	funct.	diseas
1. <u>Type C botulism</u>	()	()	()	()	()
2. _____	()	()	()	()	()
3. _____	()	()	()	()	()

NATIONAL WILDLIFE HEALTH CENTER - NECROPSY REPORT

Submitter's Name, Affiliation Address

Ken Multerer
Bill Curry
FWS-RCA
3990 E. Broad Street
Columbus, OH 43216

Case: 6546
Accession: 003
Collected: 8/14/86
Exam Date: (8/20/86)
Pathologist: LNL *WZ*

Species: Short-bill dowitcher Specimen: Carcass
Bandtype: (E) Ref/Band No: () Bot? Euth: (N) Weight: (Gm) (85)
History Summary: See 001.

External/Internal Observations - Laboratory Results

External: There is a prominent sternal keel. This carcass shows marked postmortem changes and unsuitable for laboratory study.

Internal:

Carcass was discarded

Preliminary Diagnosis: *Rotten. Carcass discarded*
Sex () Age ()/() Body Cond. () Postmortem State (P) Giz. Lead ()/()
Samples Saved:
1. _____ 4. _____
2. _____ 5. _____
3. _____ 6. _____

Final Diagnosis (order of importance)

	topog.	morph.	Exam type (GO)		
			etiol.	funct.	disease
1. <i>Open. Rotten. Carcass was</i>	()	()	()	()	()
2. <i>discarded</i>	()	()	()	()	()
3. _____	()	()	()	()	()

NATIONAL WILDLIFE HEALTH CENTER - NECROPSY REPORT

Submitter's Name, Affiliation Address

Ken Multerer
Bill Curry
FWS-RCA
3990 E. Broad Street
Columbus, OH 43216

Case: 6546
Accession: 004
Collected: 8/14/86
Exam Date: (8/20/86)
Pathologist: LNL

Species: Semipalmated sandpiper Specimen: Carcass
Bandtype: (E) Ref/Band No: () Bot5 Euth: (N) Weight: (Gm) (30)
History Summary: See 001.

External/Internal Observations - Laboratory Results

External: Sternal keel is somewhat prominent. There is staining of the vents. No fractures of the leg or wing bones seen.

Internal:

Examination shows that postmortem changes in this Sandpiper are too advanced for subsequent laboratory study so this carcass will be discarded.

Preliminary Diagnosis:

Sex () Age ()/() Body Cond. () Postmortem State (P) Giz. Lead ()/()

Samples Saved:

1. None 4. _____
2. _____ 5. _____
3. _____ 6. _____

Final Diagnosis (order of importance)

	topog.	morph.	Exam type (GO)		
			etiol.	funct.	disease
1. <u>Rotten Carcass discarded</u>	()	()	()	()	()
2. _____	()	()	()	()	()
3. _____	()	()	()	()	()

NATIONAL WILDLIFE HEALTH CENTER - NECROPSY REPORT

Submitter's Name, Affiliation Address

Ken MKulterer
Bill Curry
FWS-RCA
3990 E. Brood Street
Columbus, OH 43216

Case: 6546
Accession: 005
Collected: 8/14/86
Exam Date: (8/20/86)
Pathologist: LNL LNL

Species: Semipalmated sandpiper Specimen: Carcass
Bandtype: (E) Ref/Band No: (Bot3) Euth: (N) Weight: (Gm) ()
History Summary: See 001.

External/Internal Observations - Laboratory Results

External: No significant findings (NSF)

Internal/Musculoskeletal system: Pectoral muscles are moderately reduced +1. There is a moderate amount of subcutaneous fat and abdominal fat.
Cardiovascular system: Heart - Grossly normal.
Respiratory system: Lungs - Grossly normal.
Digestive system: Liver - Normal. Gall bladder - Normal. Intestinal tract - Grossly normal.
Gizzard - Gizzard lining is normal. No ingested lead or steel shot.
No obvious lesions in the liver, lungs or kidneys.
Urogenital system: Kidneys - Lighter than normal, light purple in color.

BACTERIOLOGY: Heart Pool- Clostridium botulinum C (Positive).

TOXICOLOGY: Liver Lead- 0.0 ppm wet wt; 0.0 ppm dry wt.

Preliminary Diagnosis: Suspect botulism

Sex (F) Age (1)/() Body Cond. (G) Postmortem State (G) Giz. Lead (0)/(0)

Samples Saved:

1. Bact: heart-bot	4. _____
2. Tox: liver-Pb	5. _____
3. _____	6. _____

Final Diagnosis (order of importance)

	topog.	morph.	Exam type (G03)		
			etiol.	funct.	disea
1. <u>Type C Botulism.</u>	()	()	()	()	()
2. _____	()	()	()	()	()
3. _____	()	()	()	()	()

NATIONAL WILDLIFE HEALTH CENTER - NECROPSY REPORT

Submitter's Name, Affiliation Address

Ken Multerer
Bill Curry
FWS-RCA
3990 E. Brood Street
Columbus, OH 43216

Case: 6546
Accession: 006
Collected: 8/14/86
Exam Date: (8/20/86)
Pathologist: LNL *AK*

Species: Semipalmated sandpiper Specimen: Carcass
Bandtype: (E) Ref/Band No: () Bot8 Euth: (Y) Weight: (Gm) ()
History Summary: See 001. This bird was found sick and then killed.

External/Internal Observations - Laboratory Results

External: No significant findings (NSF)

Internal/Musculoskeletal system: Pectoral muscles are normal. Excellent deposits of subcutaneous fat, 1 to 2 mm thick. Good deposits of abdominal fat.
Cardiovascular system: Normal - Coronary fat is present on the heart.
Digestive system: Good deposits of abdominal fat. Liver and gall bladder - Normal. Gizzard - Normal. No ingested lead or steel shot.
Respiratory system: Normal.
Urogenital system: Ovary is that of a non-breeding adult female. Follicles are 1 mm or less in diameter. Kidneys are grossly normal.

BACTERIOLOGY: Heart Pool- Clostridium botulinum C (Positive).

TOXICOLOGY: Liver Lead- Not Detected.

Preliminary Diagnosis:

Suspect botulism

Sex (F) Age (A)/() Body Cond. (C) Postmortem State (E) Giz. Lead ()/()

Samples Saved:

- | | |
|--------------------|----------|
| 1. Bact: heart-bot | 4. _____ |
| 2. Tox: liver-lead | 5. _____ |
| 3. _____ | 6. _____ |

Final Diagnosis (order of importance)

	topog.	morph.	Exam type (GO)		
			etiol.	funct.	disea
1. <i>Type C. Botulism</i>	()	()	()	()	()
2. _____	()	()	()	()	()
3. _____	()	()	()	()	()

NATIONAL WILDLIFE HEALTH CENTER - NECROPSY REPORT

Submitter's Name, Affiliation Address

Ken Multerer
Bill Curry
FWS-RCA
3990 E. Brood Street
Columbus, OH 43216

Case: 6546
Accession: 007
Collected: 8/14/86
Exam Date: (8/20/86)
Pathologist: LNL

Species: Least sandpiper Specimen: Carcass
Bandtype: (E) Ref/Band No: (B04) Euth: (N) Weight: (Gm) (45)
History Summary: See 001.

External/Internal Observations - Laboratory Results

External: No significant findings (NSF)

Internal/Musculoskeletal system: There is some subcutaneous fat present. Pectoral muscles are moderately reduced +2.

Cardiovascular system: The heart is grossly normal. There is a small amount of coronary fat present.

Respiratory system: Grossly normal

Digestive system: Grossly normal. Gizzard - Normal. No ingested steel or lead shot present.

Intestinal tract - Grossly normal.

Urogenital system: Grossly normal. Testes and kidneys - normal.

BACTERIOLOGY: Heart Pool- Clostridium botulinum C (Positive).

TOXICOLOGY: Liver Lead- 0.65 ppm wet wt; 2.25 ppm dry wt.

Preliminary Diagnosis: Suspect botulism

Sex (M) Age (A)/() Body Cond. (G) Postmortem State (G) Giz. Lead ()/()

Samples Saved:

- | | |
|-----------------|----------|
| 1. <u>Heart</u> | 4. _____ |
| 2. _____ | 5. _____ |
| 3. _____ | 6. _____ |

Final Diagnosis (order of importance)

	topog.	morph.	etiol.	funct.	disea
1. <u>Type C Botulism</u>	()	()	()	()	()
2. _____	()	()	()	()	()
3. _____	()	()	()	()	()

NATIONAL WILDLIFE HEALTH CENTER - NECROPSY REPORT

Submitter's Name, Affiliation Address

Ken Multerer
Bill Curry
FWS-RCA
3990 E. Brood Street
Columbus, OH 43216

Case: 6546
Accession: 008
Collected: 8/14/86
Exam Date: (8/20/86)
Pathologist: LNL

Species: Least sandpiper Specimen: Carcass
Bandtype: (E) Ref/Band No: () Bot6 Euth: (N) Weight: (Gm) (40)
History Summary: See 001.

External/Internal Observations - Laboratory Results

External: No significant findings (NSF)

Internal/Musculoskeletal system: Pectoral muscles are slightly reduced. There is a moderate amount of subcutaneous and abdominal fat.
Cardiovascular system: Some coronary fat was present. Heart - Grossly normal.
Respiratory system: Lungs - Grossly normal.
Digestive system: Liver - Grossly normal. Intestinal tract - Normal. Gizzard - Normal. No ingested lead shot.

Preliminary Diagnosis: Suspect botulism

Sex (M) Age (A)/() Body Cond. (G) Postmortem State (G) Giz. Lead (0)/(0)

Samples Saved:

1. _____	4. _____
2. _____	5. _____
3. _____	6. _____

Final Diagnosis (order of importance)

	topog.	morph.	Exam type (GO)		
			etiol.	funct.	disease
1. <u>Suspect Botulism</u> () () () () ()					
2. _____ () () () () ()					
3. _____ () () () () ()					

APPENDIX D
BIRD SPECIES REPORTED FROM
THE DIKE 14 CDF BEFORE AND AFTER
THE PILOT PROJECT

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers:

William A. Kamm

Nancy R. Klamm

Field Time:

To:

From:

Total:

Localities:

Distance: By Car — On Foot

Finish:

Start:

Total:

Day & Date:

WATER BIRDS

...Common Loon

...Horned Grebe

...Pied-billed Grebe

...Double-crested Cormorant

HERONS

- Great Blue Heron
- American Egret *common*
- Snowy Egret
- Little Blue Heron
- Green Heron
- Black-crowned Night Heron
- American Bittern
- Least Bittern

SWANS, GEESE, DUCKS

- ...Whistling Swan
- ...Canada Goose
- ...Snow Goose
- ...Blue Goose
- ...Mallard
- ...Black Duck
- ...Gadwall
- ...European Widgeon
- ...Baldpate *American Widgeon*
- ...Pintail
- ...Green-winged Teal
- ...Blue-winged Teal
- ...Shoveller
- ...Wood Duck
- ...Redhead
- ...Ring-necked Duck
- ...Canvas-back
- ...Greater Scaup Duck
- ...Lesser Scaup Duck
- ...American Golden-eye
- ...Buffle-head
- ...Oldsquaw
- ...White-winged Scoter
- ...Ruddy Duck
- ...Hooded Merganser
- ...American Merganser
- ...Red-breasted Merganser

VULTURES, HAWKS, FALCONS

Turkey Vulture
Sharp-shinned Hawk
Cooper's Hawk
Red-tailed Hawk
Red-shouldered Hawk
Broad-winged Hawk
Rough-legged Hawk
Bald Eagle (2 right)
Marsh Hawk
Osprey
Duck Hawk
Pigeon Hawk
Screech Hawk (2 right)

GALLINACEOUS BIRDS

Ruffed Grouse
Hungarian Partridge
Bob-white
Ring-necked Pheasant

MARSH BIRDS

King Rail
Virginia Rail
Sora
Florida Gallinule
Coot

SHOREBIRDS

Piping Plover
Semipalmated Plover
Killdeer
Golden Plover
Black-bellied Plover
Ruddy Turnstone

- Woodcock
- Wilson's Snipe
- Hudsonian Curlew
- Upland Plover
- Spotted Sandpiper
- Solitary Sandpiper
- Willet
- Greater Yellow-legs
- Lesser Yellow-legs
- Knot
- Pectoral Sandpiper
- White-rumped Sandpiper
- Baird's Sandpiper
- Least Sandpiper
- Red-backed Sandpiper
- Dowitcher

Stilt Sandpiper
Semipalmated Sandpiper
Western Sandpiper
Buff-breasted Sandpiper
Sanderling

Red Phalarope
Wilson's Phalarope
Northern Phalarope

GULLS AND TERNS

... Glaucous Gull
 ... Great Black-backed Gull
 ... Herring Gull
 Ring-billed Gull
 Franklin's Gull
 Bonaparte's Gull

Forster's Tern
 Common Tern
 Caspian Tern
 Black Tern

DOVES AND PIGEONS

Rock Dove
Mourning Dove

CUCKOOS

Yellow-billed Cuckoo
Black-billed Cuckoo

OWLS

Barn Owl
Screech Owl
Great Horned Owl
Snowy Owl
Barred Owl
Long-eared Owl
Short-eared Owl
Saw-whet Owl

GOATBUCKERS, ETC.

Whip-poor-will
Nighthawk
Chimney Swift
Ruby-throated Hummingbird
Belted Kingfisher

WOODPECKERS

.....Flicker
.....Red-bellied Woodpecker
.....Red-headed Woodpecker
.....Yellow-bellied Sapsucker
.....Hairy Woodpecker
.....Downy Woodpecker

FLYCATCHERS	GNATCATCHERS, ETC.	WEAVER BIRDS
<input type="checkbox"/> Eastern Kingbird <input type="checkbox"/> Crested Flycatcher <input type="checkbox"/> Phoebe <input type="checkbox"/> Yellow-bellied Flycatcher <input type="checkbox"/> Acadian Flycatcher <input type="checkbox"/> Alder Flycatcher <input type="checkbox"/> Least Flycatcher <input type="checkbox"/> Wood Pewee <input type="checkbox"/> Olive-sided Flycatcher <input type="checkbox"/> Empidonax	<input type="checkbox"/> Blue-gray Gnatcatcher <input type="checkbox"/> Golden-crowned Kinglet <input type="checkbox"/> Ruby-crowned Kinglet <input type="checkbox"/> American Pipit <input type="checkbox"/> Cedar Waxwing <input type="checkbox"/> Northern Shrike <input type="checkbox"/> Migrant Shrike <input type="checkbox"/> Starling	<input type="checkbox"/> English Sparrow
LARKS	VIREOS	BLACKBIRDS AND ORIOLES
<input type="checkbox"/> Horned Lark	<input type="checkbox"/> White-eyed Vireo <input type="checkbox"/> Yellow-throated Vireo <input type="checkbox"/> Blue-headed Vireo <input type="checkbox"/> Red-eyed Vireo <input type="checkbox"/> Philadelphus Vireo <input type="checkbox"/> Warbling Vireo	<input type="checkbox"/> Bobolink <input type="checkbox"/> Meadowlark <input type="checkbox"/> Western Meadowlark <input type="checkbox"/> Red-wing Blackbird <input type="checkbox"/> Orchard Oriole <input type="checkbox"/> Baltimore Oriole <input type="checkbox"/> Rusty Blackbird <input type="checkbox"/> Brewer's Blackbird <input type="checkbox"/> Heermann Grackle <input type="checkbox"/> Cowbird
SWALLOWS	WOOD WARBLERS	TANAGERS
<input type="checkbox"/> Tree Swallow <input type="checkbox"/> Bank Swallow <input type="checkbox"/> Rough-winged Swallow <input type="checkbox"/> Barn Swallow <input type="checkbox"/> Cliff Swallow <input type="checkbox"/> Purple Martin	<input type="checkbox"/> Black and White Warbler <input type="checkbox"/> Prothonotary Warbler <input type="checkbox"/> Golden-winged Warbler <input type="checkbox"/> Blue-winged Warbler <input type="checkbox"/> Tennessee Warbler <input type="checkbox"/> Orange-crowned Warbler <input type="checkbox"/> Nashville Warbler <input type="checkbox"/> Parula Warbler <input type="checkbox"/> Yellow Warbler <input type="checkbox"/> Magnolia Warbler <input type="checkbox"/> Cape May Warbler <input type="checkbox"/> Black-throated Blue Warbler <input type="checkbox"/> Myrtle Warbler <input type="checkbox"/> Black-throated Green Warbler <input type="checkbox"/> Cerulean Warbler <input type="checkbox"/> Blackburnian Warbler <input type="checkbox"/> Chestnut-sided Warbler <input type="checkbox"/> Bay-breasted Warbler <input type="checkbox"/> Blackpoll Warbler <input type="checkbox"/> Pine Warbler <input type="checkbox"/> Prairie Warbler <input type="checkbox"/> Palm Warbler <input type="checkbox"/> Ovenbird <input type="checkbox"/> Northern Water-thrush <input type="checkbox"/> Louisiana Water-thrush <input type="checkbox"/> Kentucky Warbler <input type="checkbox"/> Connecticut Warbler <input type="checkbox"/> Mourning Warbler <input type="checkbox"/> Yellow-throat <input type="checkbox"/> Yellow-breasted Chat <input type="checkbox"/> Hooded Warbler <input type="checkbox"/> Wilson's Warbler <input type="checkbox"/> Canada Warbler <input type="checkbox"/> Redstart	<input type="checkbox"/> Scarlet Tanager
CROWS AND JAYS	FINCHES, SPARROWS, etc.	
<input type="checkbox"/> Blue Jay <input type="checkbox"/> Crow	<input type="checkbox"/> Cardinal <input type="checkbox"/> Rose-breasted Grosbeak <input type="checkbox"/> Indigo Bunting <input type="checkbox"/> Dickcissel <input type="checkbox"/> Evening Grosbeak <input type="checkbox"/> Purple Finch <input type="checkbox"/> Pine Grosbeak <input type="checkbox"/> Redpoll <input type="checkbox"/> Pine Siskin <input type="checkbox"/> Goldfinch <input type="checkbox"/> Red Crossbill <input type="checkbox"/> White-winged Crossbill <input type="checkbox"/> Red-eyed Towhee <input type="checkbox"/> Savannah Sparrow <input type="checkbox"/> Grasshopper Sparrow <input type="checkbox"/> Henslow's Sparrow <input type="checkbox"/> Sharp-shinned Sparrow <input type="checkbox"/> Vesper Sparrow <input type="checkbox"/> Lark Sparrow <input type="checkbox"/> Slate-colored Junco <input type="checkbox"/> Tree Sparrow <input type="checkbox"/> Chipping Sparrow <input type="checkbox"/> Field Sparrow <input type="checkbox"/> White-crowned Sparrow <input type="checkbox"/> White-throated Sparrow <input type="checkbox"/> Fox Sparrow <input type="checkbox"/> Lincoln's Sparrow <input type="checkbox"/> Swamp Sparrow <input type="checkbox"/> Song Sparrow <input type="checkbox"/> Landlord Larkspeur <input type="checkbox"/> Snow Bunting <input type="checkbox"/> House Finch	
TITMICE, NUTHATCHES, CREEPERS		
<input type="checkbox"/> Black-capped Chickadee <input type="checkbox"/> Tufted Titmouse <input type="checkbox"/> White-breasted Nuthatch <input type="checkbox"/> Red-breasted Nuthatch <input type="checkbox"/> Brown Creeper		
WRENS		
<input type="checkbox"/> House Wren <input type="checkbox"/> Winter Wren <input type="checkbox"/> Bewick's Wren <input type="checkbox"/> Carolina Wren <input type="checkbox"/> Long-billed Marsh Wren <input type="checkbox"/> Short-billed Marsh Wren		
MOCKINGBIRDS		
<input type="checkbox"/> Mockingbird <input type="checkbox"/> Catbird <input type="checkbox"/> Brown Thrasher		
THRUSHES		
<input type="checkbox"/> Robin <input type="checkbox"/> Wood Thrush <input type="checkbox"/> Hermit Thrush <input type="checkbox"/> Olive-backed Thrush <input type="checkbox"/> Gray-cheeked Thrush <input type="checkbox"/> Veery <input type="checkbox"/> Bluebird		

FIELD NOTES

Total Species:

Individuals:

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers:

William A. Kamm

Nancy R. Klamm

Field Time:

To:

From:

Total:

Localities:

Distance: By Car — On Foot

Finish:

Start:

Total:

Day & Date:

[illegible]

FLYCATCHERS Eastern Kingbird Crested Flycatcher Phoebe Yellow-bellied Flycatcher Acadian Flycatcher Blue Flycatcher <i>Yellow</i> Least Flycatcher Wood Pewee Olive-sided Flycatcher Empidonax	GNATCATCHERS, ETC. Blue-gray Gnatcatcher Golden-crowned Kinglet Ruby-crowned Kinglet American Pipit Cedar Waxwing Northern Shrike Migrant Shrike Starling	WEAVER BIRDS English Sparrow BLACKBIRDS AND ORIOLES Bobolink Meadowlark Western Meadowlark Red-wing Blackbird Orchard Oriole Indigo Oriole <i>Warbler</i> Rusty Blackbird Brewer's Blackbird House Oriole <i>Orchard Oriole</i> Cowbird
LARKS Horned Lark SWALLOWS Tree Swallow Bank Swallow Rough-winged Swallow Barn Swallow Cliff Swallow Purple Martin	VIREOS White-eyed Vireo Yellow-throated Vireo Blue-headed Vireo Red-eyed Vireo Philadelphia Vireo Warbling Vireo	TANAGERS Scarlet Tanager
CROWS AND JAYS Blue Jay Crow	WOOD WARBLERS Black and White Warbler Prothonotary Warbler Golden-winged Warbler Blue-winged Warbler Tennessee Warbler Orange-crowned Warbler Nashville Warbler Parula Warbler Yellow Warbler Magnolia Warbler Cape May Warbler Black-throated Blue Warbler Myrtle Warbler Black-throated Green Warbler Cerulean Warbler Blackburnian Warbler Chestnut-sided Warbler Bay-breasted Warbler Blackpoll Warbler Pine Warbler Prairie Warbler Palm Warbler Ovenbird Northern Water-thrush Louisiana Water-thrush Kentucky Warbler Connecticut Warbler Mourning Warbler Yellowthroat Yellow-breasted Chat Hooded Warbler Wilson's Warbler Canada Warbler Redstart	FINCHES, SPARROWS, etc. Cardinal Rose-breasted Grosbeak Indigo Bunting Dickcissel Evening Grosbeak Purple Finch Pine Grosbeak Redpoll Pine Siskin Goldfinch Red Crossbill White-winged Crossbill Red-winged Towhee <i>House Wren</i> Savannah Sparrow Grasshopper Sparrow Henslow's Sparrow Sharp-shinned Sparrow Vesper Sparrow Lark Sparrow Slate-colored Junco Tree Sparrow Chipping Sparrow Field Sparrow White-crowned Sparrow White-throated Sparrow Fox Sparrow Lincoln's Sparrow Swamp Sparrow Song Sparrow Landlord Longspur Snow Bunting House Wren
TITMICE, NUTHATCHES, CREEPERS Black-capped Chickadee Tufted Titmouse White-breasted Nuthatch Red-breasted Nuthatch Brown Creeper		
WRENS House Wren Winter Wren Bewick's Wren Carolina Wren Long-billed Marsh Wren Short-billed Marsh Wren		
MOCKINGBIRDS Mockingbird Catbird Brown Thrasher		
THRUSHES Robin Wood Thrush Hermit Thrush Olive-backed Thrush <i>Carolina</i> Gray-cheeked Thrush Veery Bluebird		

FIELD NOTES

Total Species:

Individuals:

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers:

William A. Klamm

Nancy R. Klamm

Field Time:

To:

From:

Total:

Localities:

Distance: By Car — On Foot

Finish:

Start:

Total:

Day & Date:

		VULTURES, HAWKS, FALCONS			Still Sander Semipalmated Sandpiper Western Sandpiper Buff-breasted Sandpiper Sanderling Red Phalarope Wilson's Phalarope Northern Phalarope
		Turkey Vulture			
		Sharp-shinned Hawk			
		Cooters Hawk			
		Red-tailed Hawk			
		Red-shouldered Hawk			
		Broad-winged Hawk			
		Rough-legged Hawk			
		Bald Eagle			
		Marsh Hawk			
		Osprey			
		Duck Hawk <i>Hirundo</i>			
		Pigeon Hawk			
		Sparrow Hawk <i>rustic</i>			
		GALLINACEOUS BIRDS			
		Ruffed Grouse			
		Hungarian Partridge			
		Bobwhite			
		Ring-necked Pheasant			
		MARSH BIRDS			
		King Rail			
		Virginia Rail			
		Sora			
		Florida Cootie <i>Common Northern</i>			
		Coot			
		SWANS, GEESE, DUCKS <i>Male Swan</i>			
		Whistling Swan			
		Canada Goose			
		Snow Goose			
		Blue Goose			
		Mallard			
		Black Duck			
		Gadwall			
		European Widgeon			
		Belted <i>Swan</i> <i>Admiral</i>			
		Pintail			
		Green-winged Teal			
		Blue-winged Teal			
		Shoveller			
		Wood Duck			
		Redhead			
		Ring-necked Duck			
		Canvas-back			
		Greater Scaup Duck			
		Lesser Scaup Duck			
		American Golden-eye			
		Buffle-head			
		Oldsquaw			
		White-winged Scoter			
		Ruddy Duck			
		Hooded Merganser			
		American Merganser			
		Red-breasted Merganser			
		WOODPECKERS			
		Flicker			
		Red-bellied Woodpecker			
		Red-headed Woodpecker			
		Yellow-bellied Sapsucker			
		Hairy Woodpecker			
		Downy Woodpecker			
		GOATSUCKERS, ETC.			
		Whit-poor-will			
		Nighthawk			
		Chimney Swift			
		Ruby-throated Hummingbird			
		Belted Kingfisher			
		SHOREBIRDS			
		Piping Plover			
		Semipalmated Plover			
		Killdeer			
		Golden Plover			
		Black-bellied Plover			
		Ruddy Turnstone			
		WooDcock			
		Willow's Snipe			
		Hudsonian Curlew			
		Upland Plover			
		Spotted Sandpiper			
		Solitary Sandpiper			
		Willet			
		Greater Yellow-legs			
		Lesser Yellow-legs			
		Knot			
		Pectoral Sandpiper			
		White-rumped Sandpiper			
		Baird's Sandpiper			
		Least Sandpiper			
		Red-backed Sandpiper			
		Dowitcher			
		American Coot			
		Marbled Godwit			

FLYCATCHERS Eastern Kingbird Crested Flycatcher Phoebe Yellow-bellied Flycatcher Acorn Flycatcher Alder Flycatcher <i>W. Allen</i> Least Flycatcher Wood Pewee Olive-sided Flycatcher Empidonax	GNATCATCHERS, ETC. Bluegray Gnatcatcher Golden-crowned Kinglet Ruby-crowned Kinglet American Pipit Cedar Waxwing Northern Shrike Migrant Shrike Starling	WEAVER BIRDS English Sparrow
LARKS Horned Lark	VIREOS White-eyed Vireo Yellow-throated Vireo Blue-headed Vireo Red-eyed Vireo Philadelphia Vireo Warbling Vireo	BLACKBIRDS AND ORIOLES Bobolink Meadowlark Western Meadowlark Red-wing Blackbird Orchard Oriole Baltimore Oriole Rusty Blackbird Brewer's Blackbird Red-headed Grackle <i>Grackle</i> Cowbird
SWALLOWS Tree Swallow Bank Swallow Rough-winged Swallow Barn Swallow Cliff Swallow Purple Martin	WOOD WARBLERS Black and White Warbler Prothonotary Warbler Golden-winged Warbler Blue-winged Warbler Tennessee Warbler Orange-crowned Warbler Nashville Warbler Parula Warbler Yellow Warbler Magnolia Warbler Cape May Warbler Black-throated Blue Warbler Varied Warbler <i>Yellow-crowned Warbler</i> Black-throated Green Warbler Cerulean Warbler Blackburnian Warbler Chestnut-sided Warbler Bay-breasted Warbler Blackpoll Warbler Pine Warbler Prairie Warbler Palm Warbler Green Heron Northern Water-thrush Louisiana Water-thrush Kentucky Warbler Connecticut Warbler Mourning Warbler Yellow-throat Yellow-breasted Chat Hooded Warbler Wilson's Warbler Canada Warbler Redstart	TANAGERS Scarlet Tanager
CROWS AND JAYS Blue Jay Crow		FINCHES, SPARROWS, etc. Cardinal Rose-breasted Grosbeak Indigo Bunting Dickcissel Evening Grosbeak Purple Finch Pine Grosbeak Redpoll Pine Siskin Goldfinch Red Crossbill White-winged Crossbill Red-eyed Towhee Savannah Sparrow Grasshopper Sparrow Henslow's Sparrow Sharp-shinned Sparrow Vesper Sparrow Lark Sparrow Slate-colored Junco Tree Sparrow Chipping Sparrow Field Sparrow White-crowned Sparrow White-throated Sparrow Fox Sparrow Lincoln's Sparrow Swamp Sparrow Song Sparrow Lapland Longspur Snow Bunting <i>House Finch</i>
TITMICE, NUTHATCHES, CREEPERS Black-capped Chickadee Tufted Titmouse White-breasted Nuthatch Red-breasted Nuthatch Brown Creeper		
WRENS House Wren Winter Wren Bewick's Wren Carolina Wren Long-billed Marsh Wren Short-billed Marsh Wren <i>Redstart</i>		
MOCKINGBIRDS Mockingbird Catbird Brown Thrasher		
THRUSHES Robin Wood Thrush Hermit Thrush Gray-cheeked Thrush <i>Sage Thrush</i> Gray-cheeked Thrush Veery Blenheim		

FIELD NOTES

Total Species:

Individuals:

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers:

William A. Klammer

Nancy R. Klamm

Field Time:

To:

From:

Total:

Localities:

Distance: By Car — On Foot

Finish:

Start:

Total:

Day & Date:

[illegible]

			Eastern Kingbird
			Crested Flycatcher
•			Phoebe
			Yellow-bellied Flycatcher
			Acadian Flycatcher
			Alder Flycatcher
•			Least Flycatcher
			Wood Pewee
			Olive-sided Flycatcher
			Empidonax
<hr/>			
			LARKS
•			Horned Lark
<hr/>			
			SWALLOWS
•			Tree Swallow
			Bank Swallow
			Rough-winged Swallow
			Barn Swallow
			Cliff Swallow
			Purple Martin
<hr/>			
			CROWS AND JAYS
•			Blue Jay
			Crow
<hr/>			
			TITMICE, NUTHATCHES, CREEPERS
•			Black-capped Chickadee
			Tufted Titmouse
			White-breasted Nuthatch
•			Red-breasted Nuthatch
			Brown Creeper
<hr/>			
			WRENS
•			House Wren
•			Winter Wren
•			Bewick's Wren
•			Carolina Wren
•			Long-billed Marsh Wren
•			Short-billed Marsh Wren <i>slight</i>
<hr/>			
			MOCKINGBIRDS
•			Mockingbird
•			Catbird
•			Brown Thrasher
<hr/>			
			THRUSHES
•			Robin
			Wood Thrush
•			Hermit Thrush
			Olive-backed Thrush
			Gray-cheeked Thrush
			Veery
			Bluebird

	Blue-gray Gnatcatcher
	Golden-crowned Kinglet
	Ruby-crowned Kinglet
	<u>Amereon Pint</u> <i>N.L.</i>
	Cedar Waxwing
	Northern Shrike
	Migrant Shrike
	Starling
	VIREOS
	White-eyed Vireo
	Yellow-throated Vireo
	Blue-headed Vireo
	Red-eyed Vireo
	Philadelphia Vireo
	Warbling Vireo
	WOOD WARBLERS
	Black and White Warbler
	Prothonotary Warbler
	Golden-winged Warbler
	Blue-winged Warbler
	<i>Tennessee Warbler</i>
	Orange-crowned Warbler
	Nashville Warbler
	Parula Warbler
	Yellow Warbler
	Magnolia Warbler
	Cape May Warbler
	Black-throated Blue Warbler
	<i>Myrtle Warbler</i> <i>Yellow - 2nd</i>
	Black-throated Green Warbler
	Cerulean Warbler
	Blackburnian Warbler
	chestnut-sided Warbler
	Bay-breasted Warbler
	Black-poll Warbler
	Pine Warbler
	Prairie Warbler
	Palm Warbler
	Ovenbird
	Northern Water-thrush
	Louisiana Water-thrush
	Kentucky Warbler
	Connecticut Warbler
	Mourning Warbler
	Yellow-throat
	Yellow-breasted Chat
	Hooded Warbler
	Wilson's Warbler
	Canada Warbler
	Redstart

BLACKBIRDS AND ORIOLES		
•		Bobolink
•		Meadowlark
•		Western Meadowlark
•		Red-wing Blackbird
•		Orchard Oriole
•		Baltimore Oriole
•		Rusty Blackbird
•		Brewer's Blackbird
•		Licensed Grackle <i>Johnny</i>
•		Cowbird
TANAGERS		
•		Scarlet Tanager
FINCHES, SPARROWS, etc.		
•		Cardinal
•		Rose-breasted Grosbeak
•		Indigo Bunting
•		Dickcissel
•		Evening Grosbeak
•		Purple Finch
•		Pine Grosbeak
•		Redpoll
•		Pine Siskin
•		Goldfinch
•		Red Crossbill
•		White-winged Crossbill
•		Red-eyed Towhee <i>Angie</i> - <i>white</i>
•		Savannah Sparrow
•		Grasshopper Sparrow
•		Henslow's Sparrow
•		Sharp-tailed Sparrow
•		Vesper Sparrow
•		Lark Sparrow
•		State-colored Junco
•		Tree Sparrow
•		Chipping Sparrow
•		Field Sparrow
•		White-crowned Sparrow
•		White-throated Sparrow
•		Fox Sparrow
•		Lincoln's Sparrow
•		Swamp Sparrow
•		Song Sparrow
•		Layland Longspur
•		Snow Bunting
•		<i>White-necked</i>
•		<i>the South Sparrow</i>

Individuals:

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers:

William A. Kamm

Nancy R. Klamm

Field Time:

To:

From:

Total:

Localities:

Distance: By Car — On Foot

Finish:

Start:

Total:

Day & Date:

WATER BIRDS	VULTURES, HAWKS, FALCONS	Semi-palmated Sandpiper Western Sandpiper Buff-breasted Sandpiper Sanderling Red Phalarope Wilson's Phalarope Northern Phalarope
Common Loon	Turkey Vulture <i>in flight</i>	GULLS AND TERNS
Horned Grebe	Sharp-shinned Hawk	Glaucous Gull Great Black-backed Gull Herring Gull Ring-billed Gull Franklin's Gull Bonaparte's Gull
Pied-billed Grebe	Cooper's Hawk	Forster's Tern Common Tern Cassin Tern Black Tern
Double-crested Cormorant	Red-tailed Hawk	DOVES AND PIGEONS
HERONS	Red-shouldered Hawk	Rock Dove Mourning Dove
Great Blue Heron	Broad-winged Hawk	CUCKOOS
American Egret	Rough-legged Hawk	Yellow-billed Cuckoo Black-billed Cuckoo
Snowy Egret	Bald Eagle	OWLS
Little Blue Heron	Marsh Hawk	Barn Owl Screech Owl Great Horned Owl Snowy Owl Barred Owl Long-eared Owl Short-eared Owl Saw-whet Owl
Green Heron	Osprey	GOATSUCKERS, ETC.
Black-crowned Night Heron	Duck Hawk	Whip-poor-will Nighthawk Chimney Swift Ruby-throated Hummingbird Belted Kingfisher
American Bittern	Pigeon Hawk	WOODPECKERS
Least Bittern	Sparrow Hawk <i>traced</i>	Flicker Red-bellied Woodpecker Red-headed Woodpecker Yellow-bellied Sapsucker Hairy Woodpecker Downy Woodpecker
SWANS, GEESE, DUCKS	GALLINACEOUS BIRDS	
Whistling Swan	Ruffed Grouse	
Canada Goose	Hungarian Partridge	
Snow Goose	Bob-white	
Blue Goose	Ring-necked Pheasant	
Mallard	MARSH BIRDS	
Black Duck	King Rail	
Gadwall	Virginia Rail	
European Widgeon	Sora	
Baldpate <i>traced</i>	Florida Gallinule	
Pintail	Coot	
Green-winged Teal	SHOREBIRDS	
Blue-winged Teal	Piping Plover	
Shoveller	Semi-palmated Plover	
Wood Duck	Killdeer	
Redhead	Golden Plover	
King-necked Duck	Black-bellied Plover	
Canvas-back	Ruddy Turnstone	
Greater Scaup Duck	Woodcock	
Lesser Scaup Duck	Wilson's Snipe	
American Golden-eye	Hudsonian Curlew	
Buff-head	Upland Plover	
Oldsquaw	Spotted Sandpiper	
White-winged Scoter	Solitary Sandpiper	
Ruddy Duck	Willow	
Hooded Merganser	Greater Yellow-legs	
American Merganser	Lesser Yellow-legs	
Red-breasted Merganser	Knot	

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers:

William A. Kamm

Nancy R. Klamm

Field Time:

To:

From:

Total:

Localities:

Distance: By Car — On Foot

Finish:

Start:

Total:

Day & Date:

[illegible]

FLYCATCHERS			GNATCATCHERS, ETC.			WEAVER BIRDS		
•		Eastern Kingbird	•		Blue-gray Gnatcatcher	•		English Sparrow
•		Crested Flycatcher	•		Golden-crowned Kinglet	•		
•		Phoebe	•		Ruby-crowned Kinglet	•		
•		Yellow-bellied Flycatcher	•		American Pipit	•		
•		Acadian Flycatcher	•		Cedar Waxwing	•		
•		• • Flycatcher <i>W. W.</i>	•		Northern Shrike	•		
•		Least Flycatcher	•		Migrant Shrike	•		
•		Wood Pewee	•		Starling	•		
•		Olive-sided Flycatcher						
•		Empidonax						
LARKS			VIREOS			BLACKBIRDS AND ORIOLES		
•		Horned Lark	•		White-eyed Vireo	•		Bobolink
•			•		Yellow-throated Vireo	•		Meadowlark
•			•		Blue-headed Vireo	•		Western Meadowlark
•			•		Red-eyed Vireo	•		Red-wing Blackbird
•			•		Philadelphia Vireo	•		Orchard Oriole
•			•		Warbling Vireo	•		• • <i>Northern</i> Oriole
SWALLOWS			WOOD WARBLERS			•		Rusty Blackbird
•		Tree Swallow	•		Black and White Warbler	•		Brewer's Blackbird
•		Bank Swallow	•		Prothonotary Warbler	•		Bronzed Grackle
•		Rough-winged Swallow	•		Golden-winged Warbler	•		Cowbird
•		Barn Swallow	•		Blue-winged Warbler	•		
•		Cliff Swallow	•		Tennessee Warbler	•		
•		Purple Martin	•		Orange-crowned Warbler	•		
CROWS AND JAYS			•		Nashville Warbler	•		
•		Blue Jay	•		Parula Warbler	•		
•		Crow	•		Yellow Warbler	•		
TITMICE, NUTHATCHES, CREEPERS			•		Magnolia Warbler	•		
•		Black-capped Chickadee	•		Cape May Warbler	•		
•		Tufted Titmouse	•		Black-throated Blue Warbler	•		
•		White-breasted Nuthatch	•		• • Warbler <i>yellow - rump</i>	•		
•		Red-breasted Nuthatch	•		Black-throated Green Warbler	•		
•		Brown Creeper	•		Cardinal Warbler	•		
WRENS			•		Blackburnian Warbler	•		
•		House Wren	•		Chestnut-sided Warbler	•		
•		Winter Wren	•		Bay-breasted Warbler	•		
•		Bowick's Wren	•		Blackpoll Warbler	•		
•		Carolina Wren	•		Pine Warbler	•		
•		Long-billed Marsh Wren	•		Prairie Warbler	•		
•		Short-billed Marsh Wren	•		Palm Warbler	•		
MOCKINGBIRDS			•		Green bird	•		
•		Mockingbird	•		Northern Water-thrush	•		
•		Catbird	•		Louisiana Water-thrush	•		
•		Brown Thrasher	•		Kentucky Warbler	•		
THRUSHES			•		Connecticut Warbler	•		
•		Robin	•		• • <i>Warbler</i>	•		
•		Wood Thrush	•		Yellow throat	•		
•		Hermit Thrush	•		Yellow-breasted Chat	•		
•		Olive-backed Thrush	•		• • <i>Warbler</i>	•		
•		Gray-checked Thrush	•		Wilson's Warbler	•		
•		Vireo	•		Canada Warbler	•		
•		Bluebird	•		Redstart	•		
TANAGERS			FINCHES, SPARROWS, etc.			•		Cardinal
•		Scarlet Tanager	•		Rose-breasted Grosbeak	•		Indigo Bunting
FINCHES, SPARROWS, etc.			•		Dickcissel	•		Evening Grosbeak
•			•		Purple Finch	•		Pine Grosbeak
•			•		Pine Grosbeak	•		Redpoll
•			•		Pine Siskin	•		Goldfinch
•			•		Red Crossbill	•		White-winged Crossbill
•			•		• • <i>Towhee</i> <i>W. W.</i>	•		Savannah Sparrow
•			•		Grasshopper Sparrow	•		Henslow's Sparrow
•			•		Sharp-tailed Sparrow	•		Vesper Sparrow
•			•		Lark Sparrow	•		Slate-colored Junco
•			•		Tree Sparrow	•		Chipping Sparrow
•			•		Field Sparrow	•		White-crowned Sparrow
•			•		White-throated Sparrow	•		Fox Sparrow
•			•		Lincoln's Sparrow	•		Swamp Sparrow
•			•		Song Sparrow	•		• • <i>Finch</i>
•			•		• • <i>Finch</i>	•		

FIELD NOTES

Total Species:

Individuals:

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers:

Observers:
William A. Klammm

Nancy R. Klamm

Field Time:

To:

From:

Total:

Localities:

Distance: By Car — On Foot

Finish:

Start:

Totals:

Day & Date:

[illegible]

FLYCATCHERS Eastern Kingbird Crested Flycatcher Phoebe Yellow-bellied Flycatcher Acadian Flycatcher Acadian Flycatcher <i>Wilson</i> Least Flycatcher Wood Pewee Olive-sided Flycatcher Empidonax	GNATCATCHERS, ETC. Blue-gray Gnatcatcher Golden-crowned Kinglet Ruby-crowned Kinglet American Pipit Cedar Waxwing Northern Shrike Merganser Shrike Starling	WEAVER BIRDS English Sparrow
LARKS Horned Lark	VIREOS White-eyed Vireo Yellow-throated Vireo Blue-headed Vireo <i>solitary</i> Red-eyed Vireo Philadelphia Vireo Warbling Vireo	BLACKBIRDS AND ORIOLES Bobolink Meadowlark Western Meadowlark Red-wing Blackbird Orchard Oriole Baltimore Oriole Rusty Blackbird House Blackbird <i>common</i> Bronzed Grackle Cowbird Wilson's <i>House</i> Blackbird
SWALLOWS Tree Swallow Bank Swallow Rough-winged Swallow Barn Swallow Cliff Swallow Purple Martin	WOOD WARBLERS Black and White Warbler Prothonotary Warbler Golden-winged Warbler Blue-winged Warbler Tennessee Warbler Orange-crowned Warbler Nashville Warbler Parula Warbler Yellow Warbler Magnolia Warbler Cape May Warbler Black-throated Blue Warbler Myrtle Warbler <i>yellow</i> <i>in nest</i> Black-throated Green Warbler Cerulean Warbler Blackburnian Warbler Chestnut-sided Warbler Bay-breasted Warbler Blackpoll Warbler Pine Warbler Prairie Warbler Palm Warbler Ovenbird Northern Water-thrush Louisiana Water-thrush Kentucky Warbler Connecticut Warbler Mourning Warbler Yellowthroat Yellow-breasted Chat Hooded Warbler Wilson's Warbler Canada Warbler Redstart	TANAGERS Scarlet Tanager
CROWS AND JAYS Blue Jay Crow		FINCHES, SPARROWS, etc. Cardinal Rose-breasted Grosbeak Indigo Bunting Dickcissel Evening Grosbeak Purple Finch Pine Grosbeak Redpoll Pine Siskin Goldfinch Red Crossbill White-winged Crossbill Red-eyed Vireo Savannah Sparrow Grasshopper Sparrow Henslow's Sparrow Sharp-shinned Sparrow Vesper Sparrow Lark Sparrow Slate-colored Junco Fox Sparrow Chipping Sparrow Field Sparrow White-crowned Sparrow White-throated Sparrow Fox Sparrow Lincoln's Sparrow Swamp Sparrow Song Sparrow Landmark Longspur Snow Bunting House Finch
TITMICE, NUTHATCHES, CREEPERS Black-capped Chickadee Tufted Titmouse White-breasted Nuthatch Red-breasted Nuthatch Brown Creeper		
WRENS House Wren Winter Wren Bewick's Wren Carolina Wren Long-billed Marsh Wren Short-billed Marsh Wren <i>edge</i>		
MOCKINGBIRDS Mockingbird Catbird Brown Thrasher		
THRUSHES Robin Wood Thrush Hermit Thrush Olive-backed Thrush <i>in nest</i> Gray-checked Thrush Veery Bluebird		

FIELD NOTES

Total Species:

Individuals:

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers:

Observers:
William A. Kamm

Nancy R. Klamm

Field Time:

To:

From:

Total:

Localities:

Distance: By Car — On Foot

Finish:

Start:

Total:

Day & Date:

			VULTURES, HAWKS, FALCONS	•	Stilt Sandpiper Semipalmated Sandpiper Western Sandpiper Buff-breasted Sandpiper Sanderling Ired Phalarope Wilson's Phalarope Northern Phalarope
			Turkey Vulture		
			Sharp-shinned Hawk		
			Cooper's Hawk		
			Red-tailed Hawk		
			Red-shouldered Hawk		
			Broad-winged Hawk		
			Rough-legged Hawk		
			Bald Eagle		
			Marsh Hawk		
			Osprey		
			Duck Hawk		
			Pigeon Hawk		
			Sparrow Hawk <i>Kestrel</i>		
			GALLINACEOUS BIRDS		
			Ruffed Grouse		
			Hungarian Partridge		
			Bob-white		
			Ring-necked Pheasant		
			MARSH BIRDS		
			King Rail		
			Virginia Rail		
			Sora		
			Florida Gallinule		
			Coot		
			SWANS, GEESE, DUCKS		
			Whistling Swan		
			Canada Goose		
			Snow Goose		
			Blue Goose		
			Mallard		
			Black Duck		
			Gadwall		
			European Widgeon		
			Haldpate		
			Pintail		
			Green-winged Teal		
			Blue-winged Teal		
			Showeller		
			Wood Duck		
			Redhead		
			Ring-necked Duck		
			Canvas-back		
			Greater Scaup Duck		
			Lesser Scaup Duck		
			American Golden-eye		
			Buffle-head		
			Oldsquaw		
			White-winged Scoter		
			Ruddy Duck		
			Hooded Merganser		
			American Merganser		
			Red-breasted Merganser		
			WOODPECKERS		
			Flicker		
			Red-bellied Woodpecker		
			Red-headed Woodpecker		
			Yellow-bellied Sapsucker		
			Hairy Woodpecker		
			Downy Woodpecker		

FLYCATCHERS			GNATCATCHERS, ETC.			WEAVER BIRDS		
•		Eastern Kingbird	•		Blue-gray Gnatcatcher			English Sparrow
•		Crested Flycatcher	•		Golden-crowned Kinglet			
		Phoebe			Ruby-crowned Kinglet			
		Yellow-bellied Flycatcher			American Pipit			
		Acadian Flycatcher			Cedar Waxwing			
		Alder Flycatcher			Northern Shrike			
		Least Flycatcher			Migrant Shrike			
		Wood Pewee			Starling			
		Olive-sided Flycatcher						
		Empidonax						
LARKS			VIREOS			BLACKBIRDS AND ORIOLES		
		Horned Lark			White-eyed Vireo			Bobolink
					Yellow-throated Vireo			Meadowlark
					Blue-headed Vireo <i>Southern</i>			Western Meadowlark
					Red-eyed Vireo			Red-wing Blackbird
					Philadelphia Vireo			Orchard Oriole
					Warbling Vireo			Baltimore Oriole
								Rusty Blackbird
								Brewer's Blackbird
								Hermit Grackle <i>Common</i>
								Cowbird
SWALLOWS			WOOD WARBLERS			TANAGERS		
•		Tree Swallow			Black and White Warbler			Scarlet Tanager
		Bank Swallow			Prothonotary Warbler			
		Rough-winged Swallow			Golden-winged Warbler			
		Barn Swallow			Blue-winged Warbler			
		Cliff Swallow			Tennessee Warbler			
		Purple Martin			Orange-crowned Warbler			
CROWS AND JAYS					Nashville Warbler			
•		Blue Jay			Parula Warbler			
•		Crow			Yellow Warbler			
TITMICE, NUTHATCHES, CREEPERS					Magnolia Warbler			
•		Black-capped Chickadee			Cape May Warbler			
		Tufted Titmouse			Black-throated Blue Warbler			
•		White-breasted Nuthatch			Myrtle Warbler <i>Spotted Towhee</i>			
•		Red-breasted Nuthatch			Black-throated Green Warbler			
•		Brown Creeper			Cerulean Warbler			
WRENS					Blackburnian Warbler			
•		House Wren			Chestnut-sided Warbler			
•		Winter Wren			Red-breasted Warbler			
•		Brewer's Wren			Blackpoll Warbler			
•		Carolina Wren			Pine Warbler			
•		Long-billed Marsh Wren			Parula Warbler			
•		Short-billed Marsh Wren <i>Large</i>			Indigo Bunting			
MOCKINGBIRDS					Dickcissel			
		Mockingbird			Evening Grosbeak			
		Catbird			Purple Finch			
		Brown Thrasher			Pine Grosbeak			
THRUSHES					Redpoll			
•		Robin			Pine Siskin			
•		Gray Thrush			Goldfinch			
•		Hermit Thrush			Red Crossbill			
•		Gray-backed Thrush			White-winged Crossbill			
•		Gray-cheeked Thrush			Red-eyed Towhee			
•		Vireo			Savannah Sparrow			
•		Bluebird			Grasshopper Sparrow			
					Henslow's Sparrow			
					Sharp-shinned Sparrow			
					Vesper Sparrow			
					Lark Sparrow			
					Slater-colored Junco			
					Tree Sparrow			
					Chipping Sparrow			
					Field Sparrow			
					White-crowned Sparrow			
					White-throated Sparrow			
					Fox Sparrow			
					Lincoln's Sparrow			
					Swamp Sparrow			
					Song Sparrow			
					Louisiana Sparrow			
					Snow Bunting			
					<i>House Finch</i>			

FIELD NOTES

Total Species:

Individuals:

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers:

Observers:
William A. Klamm

Nancy R. Klamm

Field Time:

To:

From:

Total:

Localities:

Little activity in Jan. Basin area all snow & ice
Feb. duplicate of Jan. 2 Mockingbirds on the upper
field on Feb. 29th. Mar. some days snow covered.

Distance: By Car — On Foot

Finish:

Start:

Total:

Day & Date:

WATER BIRDS	VULTURES, HAWKS, FALCONS	Salt Sandpiper Semipalmated Sandpiper Western Sandpiper Buff-breasted Sandpiper Sanderling Red Phalarope Wilson's Phalarope Northern Phalarope
Common Loon	Turkey Vulture	GULLS AND TERNS
Horned Grebe	Sharp-shinned Hawk	Glaucous Gull
Pied-billed Grebe	Cooper's Hawk	Great Black-backed Gull
Double-crested Cormorant	Red-tailed Hawk	Herring Gull
HERONS	Red-shouldered Hawk	Ring-billed Gull
Great Blue Heron	Broad-winged Hawk	Franklin's Gull
American Egret	Hough-legged Hawk	Bonaparte's Gull
Snowy Egret	Bald Eagle	Forster's Tern
Little Blue Heron	Marsh Hawk	Common Tern
Green Heron	Osprey	Caspian Tern
Black-crowned Night Heron	Duck Hawk	Black Tern
American Bittern	Pigeon Hawk	DOVES AND PIGEONS
Least Bittern	Sparrow Hawk <i>retired</i>	Rock Dove
SWANS, GEESE, DUCKS	GALLINACEOUS BIRDS	Mourning Dove
Whistling Swan	Ruffed Grouse	CUCKOOS
Canada Goose	Hungarian Partridge	Yellow-billed Cuckoo
Snow Goose	Bob-white	Black-billed Cuckoo
Blue Goose	Ring-necked Pheasant	OWLS
Mallard	MARSH BIRDS	Barn Owl
Black Duck	King Rail	Screech Owl
Gadwall	Virginia Rail	Great Horned Owl
European Widgeon	Sora	Snowy Owl
Baldpate <i>American Noddy</i>	Florida Gallinule	Barred Owl
Pintail	Coot	Long-eared Owl
Green-winged Teal	SHOREBIRDS	Short-eared Owl
Blue-winged Teal	Piping Plover	Saw-whet Owl
Shoveller	Semipalmated Plover	GOATSUCKERS, ETC.
Wood Duck	Killdeer	Whip-poor-will
Redhead	Golden Plover	Nighthawk
Ring-necked Duck	Black-bellied Plover	Chimney Swift
Canvas-back	Ruddy Turnstone	Ruby-throated Hummingbird
Greater Scaup Duck	Woodcock	Belted Kingfisher
Lesser Scaup Duck	Wilecote Snipe <i>2. 11. 1960</i>	WOODPECKERS
American Golden-eye	Hudsonian Curlew	Flicker
Buffle-head	Upland Plover	Red-bellied Woodpecker
Oldsquaw	Spotted Sandpiper	Red-headed Woodpecker
White-winged Scoter	Solitary Sandpiper	Yellow-bellied Sapsucker
Ruddy Duck	Willow	Hairy Woodpecker
Hooded Merganser	Greater Yellow-legs	Downy Woodpecker
American Merganser	Lesser Yellow-legs	
Red-breasted Merganser	Knot	
	Pectoral Sandpiper	
	White-rumped Sandpiper	
	Baird's Sandpiper	
	Least Sandpiper	
	Red-backed Sandpiper	

FLYCATCHERS		GNATCATCHERS, ETC.		WEAVER BIRDS	
	Eastern Kingbird		Blue-gray Gnatcatcher		English Sparrow
	Crested Flycatcher		Golden-crowned Kinglet		
	Phoebe		Ruby-crowned Kinglet		
	Yellow-bellied Flycatcher		American Pipit		BLACKBIRDS AND ORIOLES
	Acadian Flycatcher		Cedar Waxwing		Bobolink
	Alder Flycatcher		Northern Shrike		Meadowlark
	Least Flycatcher		Migrant Shrike		Western Meadowlark
	Wood Pewee		Starling		Red-winged Blackbird
	Olive-sided Flycatcher				Orchard Oriole
	Empidonax				Baltimore Oriole
					Rusty Blackbird
					Brewer's Blackbird
					Downy Woodpecker
					Cuckoo
	LARKS		VIREOS		TANAGERS
	Horned Lark		White-eyed Vireo		Scarlet Tanager
			Yellow-throated Vireo		
	SWALLOWS		Blue-headed Vireo		
	Tree Swallow		Red-eyed Vireo		
	Bank Swallow		Philadelphia Vireo		
	Rough-winged Swallow		Warbling Vireo		
	Barn Swallow				FINCHES, SPARROWS, etc.
	Cliff Swallow				Cardinal
	Purple Martin				Rose-breasted Grosbeak
			WOOD WARBLERS		Indigo Bunting
	CROWS AND JAYS		Black and White Warbler		Dickcissel
	Blue Jay		Prothonotary Warbler		Evening Grosbeak
	Crow		Golden-winged Warbler		Purple Finch
			Blue-winged Warbler		Pine Grosbeak
	TITMICE, NUTHATCHES, CREEPERS		Tennessee Warbler		Redpoll
	Black-capped Chickadee		Orange-crowned Warbler		Pine Siskin
	Tufted Titmouse		Nashville Warbler		Goldfinch
	White-breasted Nuthatch		Parula Warbler		Red Crossbill
	Red-breasted Nuthatch		Yellow Warbler		White-winged Crossbill
	Brown Creeper		Magnolia Warbler		Robust Towhee
			Cape May Warbler		Savannah Sparrow
			Black-throated Blue Warbler		Grasshopper Sparrow
	WRENS		Myrtle Warbler		Henslow's Sparrow
	House Wren		Black-throated Green Warbler		Sharp-shinned Sparrow
	Winter Wren		Cerulean Warbler		Vesper Sparrow
	Howick's Wren		Blackburnian Warbler		Lark Sparrow
	Carolina Wren		Chestnut-sided Warbler		Chipping Sparrow
	Long-billed Marsh Wren		Bay-breasted Warbler		Tree Sparrow
	Short-billed Marsh Wren		Blackpoll Warbler		Chipping Sparrow
			Pine Warbler		Tree Sparrow
			Plum Warbler		White-throated Sparrow
	MOCKINGBIRDS		Ovenbird		White-throated Sparrow
	Mockingbird		Northern Water Thrush		Lark Sparrow
	Catbird		Eastern Water Thrush		Lincoln's Sparrow
	Brown Thrasher		Kentucky Warbler		Swamp Sparrow
			Carolinian Warbler		King Sparrow
	THRUSHES		Mourning Warbler		Indigo Bunting
	Robin		Yellowthroat		Starling
	Wood Thrush		Yellowthroated Chat		
	Hermit Thrush		Hooded Warbler		
	Orange-backed Thrush		Wilson's Warbler		
	Hermit Thrush		Canada Warbler		
	Vireo		Redstart		
	Bluebird				

FIELD NOTES

Total Species:

Individuals:

Cape May, June 1988

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers:

William A. Klammer
Nancy R. Klammer

Field Time:

To:

From:

Total:

Localities:

Distance: By Car — On Foot

Finish:

Start:

Total:

Day & Date:

WATER BIRDS		VULTURES, HAWKS, FALCONS		GULLS AND TERN	
•	Common Loon	•	Turkey Vulture	•	Glaucon Gull
•	Horned Grebe	•	Sharp-shinned Hawk	•	Great Black-backed Gull
•	Pied-billed Grebe	•	Cooper's Hawk	•	Herring Gull
•	Double-crested Cormorant	•	Red-tailed Hawk	•	Ring-billed Gull
HERONS		•	Red-shouldered Hawk	•	Franklin's Gull
•	Great Blue Heron	•	Broad-winged Hawk	•	Bonaparte's Gull
•	American Egret	•	Rough-legged Hawk	•	Forster's Tern
•	Snowy Egret	•	Bald Eagle	•	Common Tern
•	Little Blue Heron	•	Marsh Hawk	•	Caspian Tern
•	Green Heron	•	Osprey	•	Black Tern
•	Black-crowned Night Heron	•	Duck Hawk		
•	American Bittern	•	Pileon Hawk		
•	Least Bittern	•	Sparrow Hawk <i>nestul</i>		
SWANS, GEESE, DUCKS		GALLINACEOUS BIRDS		DOVES AND PIGEONS	
•	Whistling Swan	•	Ruffed Grouse	•	Rock Dove
•	Canada Goose	•	Hungarian Partridge	•	Mourning Dove
•	Snow Goose	•	Bob-white		
•	Blue Goose	•	Ring-necked Pheasant		
•	Mallard	MARSH BIRDS		CUCKOOS	
•	Black Duck	•	King Rail	•	Yellow-billed Cuckoo
•	Gadwall	•	Virginia Rail	•	Black-billed Cuckoo
•	European Widgeon	•	Sora		
•	Baldpate <i>immature 11-jun</i>	•	Florida Gallinule		
•	Pintail	•	Coot	OWLS	
•	Green-winged Teal	•	SHOREBIRDS	•	Barn Owl
•	Blue-winged Teal	•	Piping Plover	•	Screech Owl
•	Shoveller	•	Semipalmated Plover	•	Great Horned Owl
•	Wood Duck	•	Killdeer	•	Snowy Owl
•	Redhead	•	Golden Plover	•	Barred Owl
•	Ring-necked Duck	•	Black-bellied Plover	•	Long-eared Owl
•	Canvas-back	•	Ruddy Turnstone	•	Short-eared Owl
•	Greater Scaup Duck	•	Woodcock	•	Saw-whet Owl
•	Lesser Scaup Duck	•	Whimbrel Snipe <i>immature</i>	GOATSUCKERS, ETC.	
•	American Golden-eye	•	Hudsonian Curlew	•	Whip-poor-will
•	Buffle-head	•	Upland Plover	•	Nighthawk
•	Oldsquaw	•	Spotted Sandpiper	•	Chimney Swift
•	White-winged Scoter	•	Solitary Sandpiper	•	Ruby-throated Hummingbird
•	Ruddy Duck	•	Willow	•	Belted Kingfisher
•	Hooded Merganser	•	Greater Yellow-legs		
•	American Merganser	•	Lesser Yellow-legs		
•	Red-breasted Merganser	•	Knot		
		•	Pectoral Sandpiper	WOODPECKERS	
		•	White-rumped Sandpiper	•	Flicker
		•	Baird's Sandpiper	•	Red-bellied Woodpecker
		•	Least Sandpiper	•	Red-headed Woodpecker
		•	Red-backed Sandpiper <i>Sunlin</i>	•	Yellow-bellied Sapsucker
		•	Dowitcher	•	Hairy Woodpecker
				•	Downy Woodpecker

FLYCATCHERS

Eastern Kingbird
Crested Flycatcher
Phoebe
Yellow-bellied Flycatcher
Acadian Flycatcher
Ash-throated Flycatcher "G. 1124"
Least Flycatcher
Wood Pewee
Olive-sided Flycatcher
Empidonax

LARKS	
1	Horned Lark

SWALLOWS		
•		Tree Swallow
•		Bank Swallow
•		Rough-winged Swallow
•		Barn Swallow
•		Cliff Swallow
•		Purple Martin

CROWS AND JAYS	
Blue Jay	
Crow	

TITMICE, NUTHATCHES, CREEPERS		
Black-capped Chickadee	1	1
Tufted Titmouse	1	1
White-breasted Nuthatch	1	1
Red-breasted Nuthatch	1	1
Brown Creeper	1	1

WRENS			
✓	✓	✓	House Wren
✓	✓	✓	Winter Wren
✓	✓	✓	Bewick's Wren
✓	✓	✓	Carolina Wren
✓	✓	✓	Long-billed Marsh Wren
✓	✓	✓	Short-billed Marsh Wren

MOCKINGBIRDS

•	•	•	Mockingbird
•	•	•	Chaffinch
•	•	•	Brown Thrasher

THRUSHES
 Robin
 Wood Thrush
 Hermit Thrush
~~Orange-breasted Thrush~~
 Gray-chinned Thrush
 Veery
 Bluebird

GNATCATCHERS, ETC.

Blue-gray Gnatcatcher	
Golden-crowned Kinglet	
Ruby-crowned Kinglet	
<u>American</u> <u>Pint</u> <u>Tit</u>	
Cedar Waxwing	
Northern Shrike	
Migrant Shrike	
Starling	

VIREOS		
		White-eyed Vireo
		Yellow-throated Vireo
		Blue-headed Vireo
●		Red-eyed Vireo
		Philadelphia Vireo
●		Warbling Vireo

WOOD WARBLERS

Black and White Warbler
Prothonotary Warbler
Golden-winged Warbler
Blue-winged Warbler
Tennessee Warbler
Orange-crowned Warbler
Nashville Warbler
Parula Warbler
Yellow Warbler
Magnolia Warbler
Cape May Warbler
Black-throated (Blue) Warbler
~~Black-throated Green Warbler~~
Black-throated Green Warbler
Cerulean Warbler
Blackburnian Warbler
Chestnut-sided Warbler
Bay-breasted Warbler
Black-bell Warbler
Pine Warbler
Palm Warbler
Palm Warbler
Ovenbird
Northern Water-thrush
Louisiana Water-thrush
Kentucky Warbler
Connecticut Warbler
Mourning Warbler
Yellow-throat
Yellow-bellied Chat
Hooded Warbler
Wilson's Warbler
Canada Warbler
Redstart

WEAVER BIRDS
English Sparrow

BLACKBIRDS AND ORIOLES	
•	Baldpate
•	Meadowlark
•	Western Meadowlark
•	Red-winged Blackbird
•	Orchard Oriole
•	Redstart Oriole
•	Rusty Blackbird
•	Brewer's Blackbird
•	Blackbird Grackles <i>S. minor</i>
•	cowbird

TANAGERS
Scarlet Tanager

FINCHES, SPARROWS, etc.

Cardinal
Rose-breasted Grosbeak
Indigo Bunting
Dickcissel
Evening Grosbeak
Purple Finch
Pine Grosbeak
Redstart
Pine Siskin
Goldfinch
Red Crossbill
White-winged Crossbill
Red-eyed Towhee
Savannah Sparrow
Chimney Sparrow
House-wren Sparrow
Sharp-shinned Sparrow
Vesper Sparrow
Lark Sparrow
State-colored Junco
Tree Sparrow
Chipping Sparrow
Least Sparrow
White-throated Sparrow
White-throated Sparrow
Fox Sparrow
Eastern Sparrow
Lincoln Sparrow
Song Sparrow
Lutescent Tanager
Rock Wren
House Wren
House Wren

Total Species:

D22

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers:

William A. Kamm

Nancy R. Klamm

Field Time:

To:

From:

Total:

Localities:

Distance: By Car — On Foot

Finish:

Start:

Total:

Day & Date:

		VULTURES, HAWKS, FALCONS			Salt Sandpiper Semipalmated Sandpiper Western Sandpiper Ruff-breasted Sandpiper Sanderling Red Phalarope Wilson's Phalarope Northern Phalarope
		Turkey Vulture			
		Sharp-shinned Hawk			
		Cooper's Hawk			
		Red-tailed Hawk			
		Red-shouldered Hawk			
		Broad-winged Hawk			
		Rough-legged Hawk			
		Bald Eagle			
		Marsh Hawk			
		Osprey			
		Duck Hawk			
		Pigeon Hawk			
		Sparrow Hawk <i>Kestrel</i>			
		GALLINACEOUS BIRDS			
		Ruffed Grouse			
		Hungarian Partridge			
		Bob-white			
		Ring-necked Pheasant			
		MARSH BIRDS			
		King Rail			
		Virginia Rail			
		Sora			
		Lesser Gallinule Common Noddy			
		Coot			
		SWANS, GEESSE, DUCKS			
		Whistling Swan			
		Canada Goose			
		Snow Goose			
		Blue Goose			
		Mallard			
		Black Duck			
		Gadwall			
		European Widgeon			
		Baldpate			
		Pintail			
		Green-winged Teal			
		Blue-winged Teal			
		Shoveller			
		Wood Duck			
		Redhead			
		Ring-necked Duck			
		Canvas-back			
		Greater Scaup Duck			
		Lesser Scaup Duck			
		American Golden-eye			
		Buffle-head			
		Oldsquaw			
		White-winged Sooter			
		Ruddy Duck			
		Hooded Merganser			
		American Merganser			
		Red-breasted Merganser			
		GULLS AND TERNS			
		Glaucous Gull			
		Great Black-backed Gull			
		Herring Gull			
		Ring-billed Gull			
		Franklin's Gull			
		Bonaparte's Gull			
		Forster's Tern			
		Common Tern			
		Caspian Tern			
		Black Tern			
		DOVES AND PIGEONS			
		Rock Dove			
		Mourning Dove			
		CUCKOOS			
		Yellow-billed Cuckoo			
		Black-billed Cuckoo			
		OWLS			
		Barn Owl			
		Screech Owl			
		Great Horned Owl			
		Snowy Owl			
		Barred Owl			
		Long-eared Owl			
		Short-eared Owl			
		Saw-whet Owl			
		GOATSUCKERS, ETC.			
		Whippoorwill			
		Nighthawk			
		Chimney Swift			
		Ruby-throated Hummingbird			
		Belted Kingfisher			
		WOODPECKERS			
		Flicker			
		Red-bellied Woodpecker			
		Red-headed Woodpecker			
		Yellow-bellied Sapsucker			
		Hairy Woodpecker			
		Downy Woodpecker			

FLYCATCHERS		
•		Eastern Kingbird
		Crested Flycatcher
		Phoebe
•		Yellow-bellied Flycatcher
		Acadian Flycatcher
		Acadian Flycatcher "H. & W."
		Least Flycatcher
		Wood Pewee
		Olive-sided Flycatcher
		Empidonax
LARKS		
		Horned Lark
SWALLOWS		
•		Tree Swallow
•		Bank Swallow
•		Rough-winged Swallow
•		Barn Swallow
•		Cliff Swallow
•		Purple Martin
CROWS AND JAYS		
•		Blue Jay
•		Crow
TITMICE, NUTHATCHES, CREEPERS		
		Black-capped Chickadee
		Tufted Titmouse
		White-breasted Nuthatch
		Red-breasted Nuthatch
		Brown Creeper
WRENS		
		House Wren
		Winter Wren
		Howick's Wren
		Carolina Wren
		Long-billed Marsh Wren
		Short-billed Marsh Wren
MOCKINGBIRDS		
•		Mockingbird
•		Catbird
•		Brown Thrasher
THRUSHES		
•		Robin
•		Wood Thrush
•		Hermit Thrush
•		Olive-backed Thrush
•		Gray-breasted Thrush
•		Veery
•		Bluebird

GNATCATCHERS, ETC.		
•		Blue-gray Gnatcatcher
		Golden-crowned Kinglet
		Ruby-crowned Kinglet
		American Pipit
		Cedar Waxwing
		Northern Shrike
		Magnificent Shrike
		Starling
VIREOS		
		White-eyed Vireo
		Yellow-throated Vireo
•		Blue-headed Vireo <i>Sulley</i>
•		Red-eyed Vireo
		Philadelphia Vireo
		Warbling Vireo
WOOD WARBLERS		
		Black and White Warbler
		Prothonotary Warbler
		Golden-winged Warbler
		Blue-winged Warbler
		Tennessee Warbler
		Orange-crowned Warbler
		Nashville Warbler
		Parula Warbler
		Yellow Warbler
		Magnolia Warbler
		Cape May Warbler
		Black-throated Blue Warbler
		Myrtle Warbler
		Black-throated Green Warbler
		Cerulean Warbler
		Blackburnian Warbler
		Chestnut-sided Warbler
		Bay-breasted Warbler
		Blackpoll Warbler
		Pine Warbler
		Prairie Warbler
		Palm Warbler
		Ovenbird
		Northern Water Thrush
		Louisiana Water Thrush
		Kentucky Warbler
		Connecticut Warbler
		Mourning Warbler
		Yellowthroat
		Yellowthroated Chat
		Hooded Warbler
		Wilson's Warbler
		Canada Warbler
		Reistart

WEAVER BIRDS		
		English Sparrow
BLACKBIRDS AND ORIOLES		
•		Bobolink
		Meadowlark
•		Western Meadowlark
•		Red-wing Blackbird
		Orchard Oriole
		Baltimore Oriole
•		Rusty Blackbird
•		Brewer's Blackbird
•		Downy Grackle <i>Johnson</i>
•		Cowbird
TANAGERS		
		Scarlet Tanager
FINCHES, SPARROWS, etc.		
•		Cardinal
		Rose-breasted Grosbeak
		Indigo Bunting
		Dickcissel
		Evening Grosbeak
		Purple Finch
		Pine Grosbeak
		Redpoll
		Pine Siskin
•		Goldfinch
		Red Crossbill
		White-winged Crossbill
		Red-eyed Towhee
		Savannah Sparrow
		Grasshopper Sparrow
		Henslow's Sparrow
		Sharp-shinned Sparrow
		Vesper Sparrow
		Lark Sparrow
		State-colored Junco
		Pine Sparrow
		Chipping Sparrow
		Field Sparrow
		White-crowned Sparrow
		White-throated Sparrow
		Fox Sparrow
		Lincoln's Sparrow
		Swamp Sparrow
		Song Sparrow
		Landlark Lutescent
		Snow Bunting
		<i>H. & W. 1911</i>

FIELD NOTES

Total Species:

Individuals:

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers:

Observers:
William A. Klamm
Nancy R. Klamm

Field Time:

To:

From:

Total:

Localities:

Since then was approx 1" of rain at the end of Aug. There were casual loose ducks, therefore saddle ducks came back. Since the 1st of Sept., there have been no ducks.

Distance: By Car — On Foot

Finish:

Start:

Total:

Day & Date:

		VULTURES, HAWKS, FALCONS			Salt Sandpiper Semipalmated Sandpiper Western Sandpiper Buff-breasted Sandpiper Sanderling Red Phalarope Wilson's Phalarope Northern Phalarope
		Turkey Vulture			
		Sharp-shinned Hawk			
		Coeper's Hawk			
		Red-tailed Hawk			
		Red-shouldered Hawk			
		Broad-winged Hawk			
		Rough-legged Hawk			
		Bald Eagle			
		Marsh Hawk			
		Omnrey			
		Duck Hawk			
		Pigeon Hawk			
		Sparrow Hawk <i>Kestrel</i>			
		GALLINACEOUS BIRDS			
		Ruffed Grouse			
		Hungarian Partridge			
		Bob-white			
		Ring-necked Pheasant			
		MARSH BIRDS			
		King Rail			
		Virginia Rail			
		Sora			
		Florida Gallinule			
		Coot			
		SWANS, GESE, DUCKS			
		Whistling Swan			
		Canada Goose			
		Snow Goose			
		Blue Goose			
		Mallard			
		Black Duck			
		Gadwall			
		European Widgeon			
		Baldpate <i>American Merganser</i>			
		Pintail			
		Green-winged Teal			
		Blue-winged Teal			
		Shoveller			
		Wood Duck			
		Redhead			
		Ring-necked Duck			
		Canvas-back			
		Greater Scaup Duck			
		Lesser Scaup Duck			
		American Golden-eye			
		Buffle-head			
		Oldsquaw			
		White-winged Scoter			
		Ruddy Duck			
		Hooded Merganser			
		American Merganser			
		Red-breasted Merganser			
		WOODPECKERS			
		Flicker			
		Red-bellied Woodpecker			
		Red-headed Woodpecker			
		Yellow-bellied Sapsucker			
		Hairy Woodpecker			
		Downy Woodpecker			
		GOATSUCKERS, ETC.			
		Whip-poor-will			
		Nighthawk			
		Chimney Swift			
		Ruby-throated Hummingbird			
		Belted Kingfisher			
		GULLS AND TERNS			
		Glaucous Gull			
		Great Black-backed Gull			
		Herring Gull			
		Ring-billed Gull			
		Franklin's Gull			
		Bonaparte's Gull			
		Forster's Tern			
		Common Tern			
		Caspian Tern			
		Black Tern			
		DOVES AND PIGEONS			
		Rock Dove			
		Mourning Dove			
		CUCKOOS			
		Yellow-billed Cuckoo			
		Black-billed Cuckoo			
		OWLS			
		Barn Owl			
		Screech Owl			
		Great Horned Owl			
		Snowy Owl			
		Barred Owl			
		Long-eared Owl			
		Short-eared Owl			
		Saw-whet Owl			

FLYCATCHERS Eastern Kingbird Crested Flycatcher Phoebe Yellow-bellied Flycatcher Acadian Flycatcher Alder Flycatcher Least Flycatcher Wood Pewee Olive-sided Flycatcher Empidonax	GNATCATCHERS, ETC. Blue-gray Gnatcatcher Golden-crowned Kinglet Ruby-crowned Kinglet American Pipit Cedar Waxwing Northern Shrike Migrant Shrike Starling	WEAVER BIRDS English Sparrow
LARKS Horned Lark	VIREOS White-eyed Vireo Yellow-throated Vireo Blue-headed Vireo Red-eyed Vireo Philadelphia Vireo Warbling Vireo	BLACKBIRDS AND ORIOLES Bobolink Meadowlark Western Meadowlark Red-wing Blackbird Orchard Oriole Baltimore Oriole Rusty Blackbird Brewer's Blackbird Bronzed Grackle Cowbird
SWALLOWS Tree Swallow Bank Swallow Rough-winged Swallow Barn Swallow Cliff Swallow Purple Martin	WOOD WARBLERS Black and White Warbler Prothonotary Warbler Golden-winged Warbler Blue-winged Warbler Tennessee Warbler Orange-crowned Warbler Nashville Warbler Parula Warbler Yellow Warbler Magnolia Warbler Cape May Warbler Black-throated Blue Warbler Mistle Warbler <i>Yellow-rumped</i> Black-throated Green Warbler Cerulean Warbler Blackburnian Warbler Chestnut-sided Warbler Bay-breasted Warbler Black-poll Warbler Pine Warbler Puerto Warbler Palm Warbler Ovenbird Northern Water-thrush Louisiana Water-thrush Kentucky Warbler Connecticut Warbler Mourning Warbler Yellow-throat Yellow-breasted Chat Hooded Warbler Wilson's Warbler Canada Warbler Redstart	TANAGERS Scarlet Tanager
CROWS AND JAYS Blue Jay Crow		FINCHES, SPARROWS, etc. Cardinal Rose-breasted Grosbeak Indigo Bunting Dickcissel Evening Grosbeak Purple Finch Pine Grosbeak Redpoll Pine Siskin Goldfinch Red Crossbill White-winged Crossbill Red-eyed Towhee Savannah Sparrow Grasshopper Sparrow Henslow's Sparrow Sharp-tailed Sparrow Vesper Sparrow Lark Sparrow Slate-colored Junco Tree Sparrow Chipping Sparrow Field Sparrow White-crowned Sparrow White-throated Sparrow Fox Sparrow Lincoln's Sparrow Swamp Sparrow Song Sparrow Lapland Longspur Snow Bunting <i>House Finch</i>
TITMICE, NUTHATCHES, CREEPERS Black-capped Chickadee Tufted Titmouse White-breasted Nuthatch Red-breasted Nuthatch Brown Creeper		
WRENS House Wren Winter Wren Bewick's Wren Carolina Wren Long-billed Marsh Wren Short-billed Marsh Wren		
MOCKINGBIRDS Mockingbird Catbird Brown Thrasher		
THRUSHES Robin Wood Thrush Hermit Thrush Olive-backed Thrush <i>Swainson</i> Gray-cheeked Thrush Veery Bluebird		

FIELD NOTES

Total Species:

Individuals:

APPENDIX E
SAGINAW, MI, CDF BOTULISM CONTROL MANAGEMENT PLAN
(Includes an excerpt from the 1982 Saginaw CDF Operations Manual
referring to botulism control.)

**CONFINED DISPOSAL FACILITY
BOTULISM CONTROL MANAGEMENT PLAN
SAGINAW, MICHIGAN
JANUARY, 1982**

I. DATA GATHERING PHASE

Saginaw Bay CDF Monitoring Plan

1. Site visits: Once per 2 weeks starting when temperatures reach the mid-60's (around 15 April). Once per week starting mid-June.
2. Monitoring team will consist of at least one person from the Corps and one person from the Michigan Department of Natural Resources (MDNR).
3. Corps will provide boat.
4. Corps will provide instruments to measure temperature and dissolved oxygen (DO).
5. Personnel will walk the perimeter of at least the north dike.
6. Measurements of temperature and DO will be made of any accessible ponded water.
7. Inspectors should indicate on map of CDF (using a new map every week):
 - a) Locations of birds:
 1. Numbers & types (species) estimated.
 2. Conditions of birds.
 - b) Note on map: mud areas, ponded water, mud crack areas, dry-firm areas.
 - c) Note on map: areas with vegetation.
 - d) Other general comments should be written at bottom of map or attached, including climate conditions.
8. Inspectors will take 12 photos each trip showing general condition of the facility.

II. REACTION PHASE

Saginaw Bay CDF Immediate Response Plan

1. If the monitoring team reports sick or dead birds or other individuals report sick or dead birds, the Corps and MDNR will react immediately.
2. Initial contacts are Stanley R. Jacek, Corps of Engineers (313-226-6796) and Daniel Morgan, MDNR 8-253-3930 (517-373-3930).
- 3a. Sick and dead birds collected will be provided to the MDNR field representative, and MDNR laboratories will make the determination of whether or not botulism is present in the affected birds.
- 3b. Response will include an increase in field visits to two or more times per week to remove dead birds.

4. If botulism is found by the MDNR to be the problem, exploders will be put into operation - up to nine on the north cell dike. (If more exploders are needed, borrow from FWS, and purchase more).

5. Experiments with placement of imitation snow owls on rafts will be accomplished. Owls to be provided by the MDNR Roscommon Office.

6. Additionally, a determination would be made as to whether or not operational changes should be made as a response. These changes could include:

- a. Stopping dredging.
- b. Pumping more fresh water after each dredge load discharge.

III. LONG-RANGE OPERATIONAL PHASE

Saginaw Bay CDF Operational Plan

This plan is predicated on the knowledge that water management practices within the disposal site are the key to the successful control of the toxin-producing bacteria.

This plan includes the following:

1. Date of Material Placement

- a. Place material into the CDF as late in the year as practicable. Cold weather (less than 68° F) inhibits production of the toxin. Not discharging into the CDF will keep sediments dry, thus inhibiting bacterial growth.
- b. *Fall material placement has an added advantage of holding back the protein substitute (organics in the dredge material which the bacteria need) until after it is too late in the year for the bacteria to grow.*

2. Planned Distribution of Dredged Material Within the Dikes

- a. Place material directly into the low areas (presently on the east side) during dredging operations. This would allow the mud flats to dry out, and keep a water layer over the most recently placed material.
- b. Movement of material after initial dredge placement by use of small hydraulic dredge placed within CDF.

3. Drying of Sediments Within the CDF

- a. Evaporative drying will remove water from the upper few inches of dredged material by capillary resupply of the soil, resulting in crust formation. This aids precipitation runoff via desiccation cracks.
- b. Good surface drainage, rapidly removing precipitation and preventing ponding of surface water, accelerates evaporative drying. The most efficient method of promoting good surface drainage is by constructing drainage trenches in the disposal area.*

* EM 1110-2-5007 18 Dec 1978.

- c. A dragline could be used to form a perimeter trench, 12 to 15 ft inside the dike, 6 to 8 ft wide, and 12 to 24 in. deep. Operations would normally begin at the weir, digging a sump, extending into the disposal area using maximum boom and bucket reach. Because the material is already piled to the top of the weir, at Saginaw, it would probably be best to allow it to drain to the east side into the existing pool, and pump that pool down to lake level if necessary. The excavated material would be cast on the interior slope of the perimeter dike.
 - d. Interior drainage via drainage trenches should be initiated when perimeter trenching decreases fluid consistency of dredged material below the thin drying skin to allow trench construction to a significant depth, and support capacity of the soil allows conventional low ground pressure construction equipment to enter the disposal area to construct the trenches.
 - e. After the above trenching has dried the top dike crust out sufficiently, a conventional dragline may be placed in the CDF on mats and trenching may take place at 4-month intervals.
 - f. Once a crust of 25 in. is achieved a small dragline may be able to operate with mats.
4. Surface trenching and drying not only decrease the chance for botulism, but help prevent mosquito problems, and firm up the soil for future use of the facility. Drying the sediments also increases CDF capacity. On a large-scale basis, costs of creating disposal volume by progressive surface trenching range from \$0.10/yd³ to \$0.30/yd³ (1977 dollars).*

IV. STUDY PHASE

- 1. Use of consultants to provide recommendations on dike management to minimize botulism outbreaks.
 - a. WES - Presently we have contacted the US Army Engineer Waterways Experiment Station (WES) at Vicksburg, MS. A representative from WES is scheduled to make a site visit to Saginaw in April. This site visit will provide the basis for immediate advice and a longer range study of disposal area management to minimize outbreaks of botulism.

* Technical Report EL-81-11, Dec 1981, pg 137.

**EXCERPT FROM:
OPERATION AND MAINTENANCE MANUAL
SAGINAW RIVER CONFINED DISPOSAL FACILITY
LAKE HURON, MICHIGAN
1982**

TABLE OF CONTENTS

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
	INTRODUCTION	
1.	Authorization	1
2.	Location	1
3.	Facility Description	1
4.	Capacity Provided	1
5.	Construction History	2
6.	Items of Local Cooperation	2
7.	Assurances	4
8.	Operation and Maintenance Manual	4
9.	Maintenance Responsibilities	4
10.	Improvement or Alterations to the Facility	5
11.	Annual Report	5
12.	Periodic Inspection	6
13.	Check Sheet	7
14.	Disposal of Private Dredgings	7
	FEATURES OF THE FACILITY	
15.	General	8
16.	Perimeter and Cross Dikes	8
17.	Discharge Weirs and Skimmers	8
18.	Turning Basin and Mooring Facilities	9
19.	Pipeline	9

TABLE OF CONTENTS (Cont.)

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
MAINTENANCE		
20.	General	9
21.	Repairs and Replacement	10
22.	Dikes	10
23.	Weirs and Skimmers	12
24.	Mooring Facility and Dredge Pipeline	13
OPERATION		
25.	Operation During Dredging	14
26.	Operation in Non-Dredging Periods	16*
27.	Botulism Control	19
APPENDICES		
A	Monitoring Manual	
B	Exhibits	
C	Inspection Check-List	
D	Measurement of Height of Weir Overflow	
E	Essential Corps of Engineers Personnel	
F	Assurances	
G	Use of Confined Disposal Areas by Permittees	

* This portion of the original text has been reproduced here as pp E8-E9.

27. BOTULISM CONTROL

- a. General - Botulism poisoning occurs as a result of ingestion of toxin produced by the bacterium *Clostridium botulinum*. The conditions for growth are simply: warm temperature, animal protein food supply, and high moisture content or water.

There are now six known types of botulism, each type designated by a letter (A-F) but all are strains of the same bacterium. Type C is responsible for most waterfowl mortalities. Types A, B, E, and F affect humans while D affects cattle. Type E, in addition to causing human disease, also causes losses of some water-associated birds in the Great Lakes area.*

Perched ponds and mud flats with warm stagnant water and dead fish or invertebrates brought up with dredged material facilitate botulism and should be avoided. The most effective method of preventing botulism is to manage the CDF with the objective of drying the dredged sediments, and to maintain close surveillance of the CDF during periods of high potential for botulism.

- b. Botulism Surveillance Period - If mud flats are present, botulism can occur when temperatures reach the mid 60s. Therefore, inspections of the CDF should be made periodically between 15 June and 31 October. Between 15 June and 1 August inspections should be made at least once every 2 weeks. During the most critical botulism season, 1 August thru 31 October, inspections should be made at least once per week. Botulism sickness in waterfowl can be identified by the following symptoms which are a result of the extent to which the central nervous system is paralyzed:

- (1) The bird is unable to fly but may still be able to swim or walk.
- (2) The bird can only sit, or flop on the ground, often not even being able to raise its head. In this case the bird will die from lack of food and water but could survive if given fresh water and protected from direct sunlight and predators.

If dead or sick ducks are found in the facility, the following actions should be taken immediately:

- (1) Contact Mr. Don Bilmaier, Chief, Operations and Maintenance Branch, 313-226-6796, who will contact the MDNR field representative.
- (2) Bury all carcasses immediately, or place carcasses in plastic bags and remove from the site. (A single decomposing carcass (animal, fish, or bird) can produce enough botulism-infected maggots to kill many waterfowl.)
- (3) Sick birds collected shall be given water and provided to the MDNR field representative for determination of whether or not botulism is present in the affected birds.

* Resources Agency of California. 1971. "Waterfowl Botulism Management," Wildlife Management Leaflet No. 14, Sacramento, CA.

- c. If botulism is found to be the problem, the Chief, Operations and Maintenance Branch will direct the appropriate response in accordance with the Detroit District "Botulism Control Management Plan" prepared for the Saginaw CDF.